

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Raymond Alejandro Examiner #: 76895 Date: 02/26/04
Art Unit: 1745 Phone Number 301(571)272-1282 Serial Number: 09/899107
Mail Box and Bldg/Room Location: Room 6B59 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Fuel Cell Separator, Process for Production Thereof, & Polymer Electrolyte
Inventors (please provide full names): Saito et al

Earliest Priority Filing Date: 07/06/01

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Please, see claims 1-8 for specific subject matter to be searched.

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FILE 'LCA' ENTERED AT 15:43:40 ON 02 MAR 2004
L1 5586 SEA (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR DUST?
OR GRIT? OR GRAIN# OR GRANUL? OR POWDER? OR SOOT? OR
SMUT? OR FINES# OR PRILL? OR FLAKE# OR PELLET? OR
BB#)/BI,AB

FILE 'HCA, WPIX, JAPIO' ENTERED AT 15:46:01 ON 02 MAR 2004
L2 39957 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)
L3 21844 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)
L4 15047 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)
TOTAL FOR ALL FILES
L5 76848 SEA FUELCELL? OR FUEL?(2A) (CELL OR CELLS)
L6 62257 SEA SEPARAT!R?
L7 92562 SEA SEPARAT!R?
L8 43191 SEA SEPARAT!R?
TOTAL FOR ALL FILES
L9 198010 SEA SEPARAT!R?

FILE 'REGISTRY' ENTERED AT 15:46:16 ON 02 MAR 2004
E CARBON/CN
L10 1 SEA CARBON/CN
E GRAPHITE/CN
L11 1 SEA GRAPHITE/CN

FILE 'HCA, WPIX, JAPIO' ENTERED AT 15:49:39 ON 02 MAR 2004
L12 431 SEA (GROOV? OR FURROW? OR CHANNEL? OR SLOT OR SLOTS OR
SLOTTED OR SLOTTING# OR STRIAT? OR MICROGROOV?) (3A) SEPARA
T!R?
L13 1546 SEA (GROOV? OR FURROW? OR CHANNEL? OR SLOT OR SLOTS OR
SLOTTED OR SLOTTING# OR STRIAT? OR MICROGROOV?) (3A) SEPARA
T!R?
L14 265 SEA (GROOV? OR FURROW? OR CHANNEL? OR SLOT OR SLOTS OR
SLOTTED OR SLOTTING# OR STRIAT? OR MICROGROOV?) (3A) SEPARA
T!R?
TOTAL FOR ALL FILES
L15 2242 SEA (GROOV? OR FURROW? OR CHANNEL? OR SLOT OR SLOTS OR
SLOTTED OR SLOTTING# OR STRIAT? OR MICROGROOV?) (3A)
SEPARAT!R?

L16 52485 SEA (L10 OR L11 OR CARBON# OR CARBONACEOUS? OR CARBONIFEROUS? OR C) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

L17 37659 SEA (L10 OR L11 OR CARBON# OR CARBONACEOUS? OR CARBONIFEROUS? OR C) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

L18 16575 SEA (L10 OR L11 OR CARBON# OR CARBONACEOUS? OR CARBONIFEROUS? OR C) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

TOTAL FOR ALL FILES

L19 106719 SEA (L10 OR L11 OR CARBON# OR CARBONACEOUS? OR CARBONIFEROUS? OR C) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

L20 18162 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL? OR DIRECTION? OR ORIENT? OR VERT# OR VERTICAL?) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

L21 9900 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL? OR DIRECTION? OR ORIENT? OR VERT# OR VERTICAL?) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

L22 6787 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL? OR DIRECTION? OR ORIENT? OR VERT# OR VERTICAL?) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

TOTAL FOR ALL FILES

L23 34849 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL? OR DIRECTION? OR ORIENT? OR VERT# OR VERTICAL?) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

L24 2426 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL?) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)

L25 1829 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL?) (2A) (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT?

OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR
MICROGRANUL? OR POWDER? OR FINES#)

L26 638 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL?) (2A) (PART
ICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT?
OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR
MICROGRANUL? OR POWDER? OR FINES#)

TOTAL FOR ALL FILES

L27 4893 SEA (AXIS OR AXISES OR AXES OR AXESES OR AXIAL?) (2A) (PART
ICL? OR MICROPARTICL? OR PARTICULAT? OR MICROPARTICULAT?
OR DUST? OR GRIT? OR GRAIN# OR GRANUL? OR MICROGRAIN# OR
MICROGRANUL? OR POWDER? OR FINES#)

L28 1 SEA L2 AND L6 AND L24

L29 0 SEA L3 AND L7 AND L25

L30 0 SEA L4 AND L8 AND L26

TOTAL FOR ALL FILES

L31 1 SEA L5 AND L9 AND L27

L32 3 SEA L2 AND L6 AND L20

L33 0 SEA L3 AND L7 AND L21

L34 0 SEA L4 AND L8 AND L22

TOTAL FOR ALL FILES

L35 3 SEA L5 AND L9 AND L23

L36 153 SEA L2 AND L6 AND L16

L37 134 SEA L3 AND L7 AND L17

L38 107 SEA L4 AND L8 AND L18

TOTAL FOR ALL FILES

L39 394 SEA L5 AND L9 AND L19

L40 10 SEA L36 AND L12

L41 9 SEA L37 AND L13

L42 2 SEA L38 AND L14

TOTAL FOR ALL FILES

L43 21 SEA L39 AND L15

L44 231 SEA L2 AND L6 AND L12

L45 87 SEA L3 AND L7 AND L13

L46 129 SEA L4 AND L8 AND L14

TOTAL FOR ALL FILES

L47 447 SEA L5 AND L9 AND L15

L48 10 SEA L44 AND L16

L49 9 SEA L45 AND L17

L50 2 SEA L46 AND L18

TOTAL FOR ALL FILES

L51 21 SEA L47 AND L19

FILE 'LCA' ENTERED AT 16:04:49 ON 02 MAR 2004

L52 731 SEA AXIS OR AXISES OR AXES OR AXESES OR AXIAL?

FILE 'HCA, WPIX, JAPIO' ENTERED AT 16:06:21 ON 02 MAR 2004

L53 22 SEA L2 AND L6 AND L52

L54 29 SEA L3 AND L7 AND L52

L55 15 SEA L4 AND L8 AND L52
TOTAL FOR ALL FILES
L56 66 SEA L5 AND L9 AND L52
L57 4 SEA L53 AND (L12 OR L16)
L58 0 SEA L54 AND (L13 OR L17)
L59 2 SEA L55 AND (L14 OR L18)
TOTAL FOR ALL FILES
L60 6 SEA L56 AND (L15 OR L19)

FILE 'LCA' ENTERED AT 16:10:12 ON 02 MAR 2004
L61 2912 SEA L10 OR L11 OR CARBON# OR CARBONACEOUS? OR CARBONIFERO
US? OR C(2A)(PARTICL? OR MICROPARTICL? OR PARTICULAT? OR
MICROPARTICULAT? OR DUST? OR GRIT? OR GRAIN# OR GRANUL?
OR MICROGRAIN# OR MICROGRANUL? OR POWDER? OR FINES#)
L62 684 SEA GROOV? OR FURROW? OR CHANNEL? OR SLOT OR SLOTS OR
SLOTTED OR SLOTTING# OR STRIAT? OR MICROGROOV?

FILE 'HCA, WPIX, JAPIO' ENTERED AT 16:17:43 ON 02 MAR 2004
L63 3 SEA L53 AND L61
L64 5 SEA L54 AND L61
L65 2 SEA L55 AND L61
TOTAL FOR ALL FILES
L66 10 SEA L56 AND L61
L67 6 SEA L53 AND L62
L68 10 SEA L54 AND L62
L69 3 SEA L55 AND L62
TOTAL FOR ALL FILES
L70 19 SEA L56 AND L62

FILE 'HCA' ENTERED AT 16:19:20 ON 02 MAR 2004
L71 10 SEA L28 OR L32 OR L57 OR L63 OR L67
L72 10 SEA (L40 OR L48) NOT L71

FILE 'WPIX' ENTERED AT 16:20:29 ON 02 MAR 2004
L73 14 SEA L41 OR L49 OR L64
L74 9 SEA L68 NOT L73

FILE 'JAPIO' ENTERED AT 16:21:18 ON 02 MAR 2004
L75 6 SEA L42 OR L50 OR L59 OR L65 OR L69

=> file hca

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L71 ANSWER 1 OF 10 HCA COPYRIGHT 2004 ACS on STN

140:114275 Proton exchange membrane electrochemical cell having an integral, electrically conductive, resiliently compressible, porous pad. Laconti, Anthony B.; Titterington, William A.; Swette, Larry L.; Leon, Ricardo; Kim, Kwang S. (USA). U.S. Pat. Appl. Publ. US 2004016638 A1 20040129, 33 pp., Cont.-in-part of U.S. Ser. No. 827,368. (English). CODEN: USXXCO. APPLICATION: US 2002-335126 20021230. PRIORITY: US 2001-827368 20010405.

AB Electrolysis cell comprises, in one embodiment, a proton exchange membrane (PEM), an anode positioned along one face of the PEM, and a cathode positioned along the other face of the PEM. A multi-layer metal screen for defining a first fluid cavity is placed in contact with the outer face of the anode, and an elec.-conductive, compressible, spring-like, porous pad for defining a second fluid cavity is placed in contact with the outer face of the cathode. The porous pad comprises a mat of **carbon** fibers bound together with one or more, preferably thermoplastic, resins, the mat having a d. of about 0.2-1.5 g/cm³. Cell frames are placed in peripheral contact with the metal screen and the compression pad for peripherally contg. fluids present there-within. Elec.-conductive **separators** are placed in contact with the metal screen and the compression pad for **axially** contg. fluids present there-within. A plurality of the cells may be arranged in series in a bipolar configuration without requiring a sep. compression pad between cells (for gas pressure differentials up to about 400 psi or greater). The invention is also directed to a **fuel cell** wherein the pad replaces the **carbon** fiber paper or **carbon** fiber cloth in contact with the cathode or anode.

IT 7440-44-0, Carbon, uses
(**particles**; proton exchange membrane electrochem. cell having integral, elec. conductive, resiliently compressible, porous pad)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IT 7782-42-5, Graphite, uses
(proton exchange membrane electrochem. cell having integral, elec. conductive, resiliently compressible, porous pad)

RN 7782-42-5 HCA

CN Graphite (8CI, 9CI) (CA INDEX NAME)

C

IC ICM C25D017-00
ICS H01M008-00

NCL 204252000; 429012000; 427115000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST proton exchange membrane electrochem cell; **fuel cell** proton exchange membrane; electrolyzer proton exchange membrane

IT **Carbon** fibers, uses
(mats; proton exchange membrane electrochem. cell having integral, elec. conductive, resiliently compressible, porous pad)

IT Coating materials
Electrochemical cells
Solid state **fuel cells**
(proton exchange membrane electrochem. cell having integral, elec. conductive, resiliently compressible, porous pad)

IT **Carbon** black, uses
(proton exchange membrane electrochem. cell having integral, elec. conductive, resiliently compressible, porous pad)

IT **7440-44-0, Carbon**, uses
(**particles**; proton exchange membrane electrochem. cell having integral, elec. conductive, resiliently compressible, porous pad)

IT **7782-42-5, Graphite**, uses
(proton exchange membrane electrochem. cell having integral, elec. conductive, resiliently compressible, porous pad)

L71 ANSWER 2 OF 10 HCA COPYRIGHT 2004 ACS on STN

139:246518 Electrically conductive compositions and molded articles therewith. Sakamoto, Shin; Okazaki, Hiroyuki (Osaka Gas Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2003253127 A2 20030910, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2002-51796 20020227.

AB Title moldable compns. comprise randomly **oriented** graphite **particles** and resins. Thus, a compn. comprising mosaic shape graphite with av. particle diam. 80 μm , BET sp. surface area 4 m^2/g , and DBP absorption 50 $\text{cc}/100 \text{ g}$ 50, graphite having stream texture with av. particle diam. 10 μm 10, conductive carbon black 5.0, and H 1 polyphenylene sulfide with av. particle diam. 10 μm 35.0% showed vol. elec. resistance 50.5 $\text{m}\Omega/\text{cm}^3$, d. 1.89 g/cm^3 , and good moldability.

IC ICM C08L101-00
ICS C01B031-04; C08K003-04; C08L061-06; C08L071-12; H01M008-02; H01M008-10

CC 37-6 (Plastics Manufacture and Processing)
Section cross-reference(s): 38, 52, 76

IT **Fuel cell separators**

(solid-electrolyte; elec. conductive compns. for molded articles)

L71 ANSWER 3 OF 10 HCA COPYRIGHT 2004 ACS on STN

139:136102 Manufacture of **fuel cell****separator** using molding process, **fuel cell****separator**, and **fuel cell**. Kato,

Toshiya; Harada, Tetsuya; Hamada, Kenichi; Kamei, Masayuki

(Dainippon Ink and Chemicals, Inc., Japan). Jpn. Kokai Tokkyo Koho

JP 2003223901 A2 20030808, 10 pp. (Japanese). CODEN: JKXXAF.

APPLICATION: JP 2002-21568 20020130.

AB The process comprises filling a female-type mold with a powder raw material to a height 0.5-1.5 times of an ideal filling height obtained by $h = w/(S \cdot \rho)$ (h = ideal filling height; w = **separator** wt.; S = **separator** projection area in the opening **direction**; and ρ = **powder** raw material bulk d.), followed by molding. The **fuel cell** has an operation temp. $\leq 200^\circ$ during the elec. generation.

IC ICM H01M008-02

ICS B29C031-04; B29C043-02; B29C043-34; B29C043-36; C08K003-04; C08L101-00; H01M008-10; B29L031-00

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell separator** molding operation tempIT **Fuel cell separators**

Molding

(manuf. of **fuel cell separator** using molding process)IT **Fuel cells**(operation temp. of **fuel cell**)

L71 ANSWER 4 OF 10 HCA COPYRIGHT 2004 ACS on STN

137:188235 Solid polymer electrolyte **fuel cell**.

Sakai, Katsunori; Shimotori, Soichiro (Toshiba Corp., Japan). Jpn.

Kokai Tokkyo Koho JP 2002246043 A2 20020830, 13 pp. (Japanese).

CODEN: JKXXAF. APPLICATION: JP 2001-42307 20010219.

AB The **fuel cell** has a stack of unit cells, contg. a solid polymer electrolyte between a cathode and an anode and **separators** outside the electrodes, where the **separators** have a pair of zigzagged reaction gas passage **grooves** from the **separator** edges toward the **axis**, reaction gas inlet and outlet manifolds connected to the inlets and outlets of the gas passage **grooves**, and a cooling medium passage parallel to the inlet side of the gas passage **grooves**.

IC ICM H01M008-02

ICS H01M008-02; H01M008-04; H01M008-10; H01M008-24

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid polymer **fuel cell** stack **separator**
structure

IT **Fuel cell separators**
(**separators** in **fuel cell** stack
contg. serpentine gas passage **grooves**, gas inlet and
outlet manifolds, and cooling medium passage)

L71 ANSWER 5 OF 10 HCA COPYRIGHT 2004 ACS on STN

137:111690 Passive air breathing **fuel cells**.

Kenyon, Kenneth H.; Doeppers, Matthew M.; Ibrahim, Samir E. (Enable
Fuel Cell Corporation, USA). U.S. US 6423437 B1 20020723, 13 pp.
(English). CODEN: USXXAM. APPLICATION: US 2001-765116 20010119.

AB A polymer electrolyte **fuel cell** includes
fuel cell units arranged along a common
axis in a stack with an inner periphery of the **fuel**
cell units defining a fuel flow **channel** through
which the fuel can flow in an **axial** direction. Current
collectors are elec. connected to the **fuel cell**
units at the top and bottom of the stack. One or more diffusion
cell units are stacked below the lower current collector and have an
inner periphery defining a continuation of the fuel flow
channel. The fuel inlet allows the introduction of hydrogen
fuel to the top end of the flow **channel** while the bottom
end of the flow **channel** below the diffusion cell units is
blocked. Water vapor and inert gases collecting at the bottom end
of the fuel flow **channel** diffuse out through the diffusion
cell units to maintain the elec. generating efficiency of the active
fuel cell units. Diffusion cell units may be
mounted in the middle of the stack where fuel is fed in from both
ends of the stack.

IC ICM H01M008-04

NCL 429032000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST passive air breathing **fuel cell**

IT Polyamides, uses
(film; passive air breathing **fuel cells**)

IT **Fuel cell separators**

Fuel cells
Polymer electrolytes
(passive air breathing **fuel cells**)

IT 1333-74-0, Hydrogen, uses
(passive air breathing **fuel cells**)

L71 ANSWER 6 OF 10 HCA COPYRIGHT 2004 ACS on STN

136:121081 **Fuel cell separators**, their

manufacture, and polymer electrolyte **fuel cells**.

Saito, Kazuo; Hagiwara, Atsushi; Miyazawa, Atsushi (Nisshin Spinning

Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002025571 A2 20020125, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-204728 20000706.

AB The **separator** comprises conductive **carbon powder** and a binder, have gas-feeding **grooves** on 1 or both sides, and is characterized by (A) contg. ≥ 50 area% conductive **carbon powder** (max. major **axis** ≥ 50 μm and max. minor **axis** ≥ 30 μm) in **separator** cross-cut section or (B) contg. 10-50 wt. parts binder per 100 wt. parts conductive **carbon powder** of spherical or bulk graphite of av. particle size 100-500 μm . Manuf. of the **separators** and solid polymer electrolyte **fuel cells** comprising the **separators** are also claimed. The **fuel cells** are impact resistant and are suitable for use as power sources in elec. ad hybrid vehicles.

IT 7440-44-0, Carbon, uses
(conductive; polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IT 7782-42-5, Graphite, uses
(polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)

RN 7782-42-5 HCA

CN Graphite (8CI, 9CI) (CA INDEX NAME)

C

IC ICM H01M008-02

ICS H01M008-10; H01M008-00

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST elec vehicle **fuel cell** conductive **carbon separator**; solid polymer electrolyte **fuel cell separator**

IT Phenolic resins, uses
(binders; polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)

IT **Fuel cell separators**
Solid state **fuel cells**

- (polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)
- IT 152618-58-1, Resitop PL 4804
(binder; polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)
- IT 7440-44-0, Carbon, uses
(conductive; polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)
- IT 7782-42-5, Graphite, uses
(polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)
- IT 557-05-1, Zinc stearate
(releasing agent; polymer electrolyte **fuel cells** with **separators** contg. conductive **carbon powder**)
- L71 ANSWER 7 OF 10 HCA COPYRIGHT 2004 ACS on STN
135:79010 Hydrogen and elemental **carbon** production from natural gas and other hydrocarbons. Detering, Brent A.; Kong, Peter C. (Bechtel BWXT Idaho, LLC, USA). PCT Int. Appl. WO 2001046067 A1 20010628, 67 pp. DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2000-US33114 20001206. PRIORITY: US 1999-PV172976 19991221.
- AB A method for converting one or more hydrocarbon reactants to diat. hydrogen and ultrafine elemental **carbon particles** in a fast quench reactor. In said quench reactor, the hydrocarbon reactants are thermally decompd. by plasma in an **axial** reactor chamber to an intermediate product stream comprising diat. hydrogen and unsatd. hydrocarbons. As the intermediate product stream exits the **axial** reactor chamber through converging-diverging nozzle the intermediate product stream is cooled down, in convergent nozzle portion, to prevent back reactions and then heated up, in divergent nozzle portion, to further decomp. the unsatd. hydrocarbons to form more diat. hydrogen along with elemental **carbon**. Coolant gases may be added at different stages in the process to form a desired end product and prevent back reactions. The product is a substantially clean-burning hydrogen

fuel that leaves no greenhouse gas emissions, and elemental **carbon** that may be used in powder form as a commodity for several processes.

IT **7440-44-0, Carbon, processes**

(hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IC ICM C01B003-24

CC 49-1 (Industrial Inorganic Chemicals)

Section cross-reference(s): 51, 52

ST natural gas processing hydrogen **carbon** manuf; hydrocarbon processing hydrogen **carbon** manuf; synthetic fuel manuf
Fischer Tropsch reaction

IT Reactors

(**axial**; hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

IT Nozzles

(divergent; hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

IT Cooling

Cyclone **separators**

Fischer-Tropsch reaction

Fuel cells

Gases

Plasma

Plasma torches

(hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

IT Hydrocarbons, processes

Natural gas, processes

(hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

IT Fuels

(synthetic; hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

IT Particles

(ultrafine; hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

IT Heat exchangers

(waste; hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)

IT 1333-74-0P, Hydrogen, preparation

(hydrogen and elemental **carbon** prodn. from natural gas

- and other hydrocarbons)
- IT 74-82-8, Methane, processes 124-38-9, **Carbon** dioxide, processes 630-08-0, **Carbon** monoxide, processes 7440-37-1, Argon, processes **7440-44-0, Carbon**, processes
(hydrogen and elemental **carbon** prodn. from natural gas and other hydrocarbons)
- L71 ANSWER 8 OF 10 HCA COPYRIGHT 2004 ACS on STN
129:163957 Liquid or gaseous hydrocarbon **fuel-cell** stack with solid electrolytes. Bossel, Ulf G. (Switz.). PCT Int. Appl. WO 9835398 A1 19980813, 56 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (German). CODEN: PIXXD2. APPLICATION: WO 1998-CH34 19980129. PRIORITY: CH 1997-296 19970211.
- AB The stack comprises disk-shaped **fuel cells** layered **axially** into a stack secured by a tension anchor, the **fuel cell** having an aperture for the 1st gas inlet and for accommodating the anchor. Each **fuel cell** includes an ion-conducting high-temp. ceramic or low-temp. polymer electrolyte; a porous O cathode layer and a porous fuel anode layer, 1 on each side of the electrolyte; a gas-permeable carrier having a 1st and a 2nd surface and **channels** for the passage of gases; a small **separator** plate, which lies at least partly on the 1st surface of the carrier; and a large elec. conductive **separator** plate, which lies on the 2nd surface of the carrier and has means for controlled guiding of the gases and cooperating with the carrier **channels**. The means for controlled guiding of the gases advantageously extend along const. lines which are not branched, deviate from the radial and from the tangential direction, and are described by an equation in polar coordinates.
- IC ICM H01M008-24
ICS H01M008-02
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST hydrocarbon **fuel cell** stack
- IT **Fuel cells**
(stack of liq. or gaseous hydrocarbon)
- L71 ANSWER 9 OF 10 HCA COPYRIGHT 2004 ACS on STN
111:236656 Manufacture of monolithic solid-oxide **fuel-cell** stack. Maricle, Donald L.; Buswell, Richard F. (International Fuel Cells Corp., USA). U.S. US 4857420 A 19890815,

8 pp. (English). CODEN: USXXAM. APPLICATION: US 1987-107817 19871013.

AB The stack is prepd. by forming a plurality of electrode subassemblies and a plurality of gas **separator**-reactor flow field subassemblies, stacking these subassemblies alternately with the cathode material layer abutting the cathode- and the anode material layer abutting the anode-flow field layers, heating the obtained preassembly to a subsintering temp. to soften and creep flatten the subassemblies and to form an intimate interfacial contact between them, and by applying a light compressive load **axially** of the preassembly during the heating step to fuse the subassemblies together. The electrode subassemblies are formed by providing appropriately sized green unsintered tapes of solid-oxide electrolyte material, sintering the tapes at .apprx.1400-1600° to form sintered plates of appropriate operational d., and by forming a finished layer of anode material on 1 and a finished layer of cathode material on the opposite surface of the sintered electrolyte plate. The other subassemblies are formed by providing appropriately sized green unsintered sheets of interconnect material; sintering the sheets at .apprx.1650-1750° to form laminae of appropriate operational d.; forming a finished anode-flow field layer, including a plurality of parallel ribs and intervening **grooves** extending across the laminae, on 1 surface of the laminae, in a 1st direction; and by forming similarly a finished cathode-flow field layer on the opposite surface of the laminae, extending in a direction perpendicular to the 1st direction.

IC H04M008-10; B05D005-12

NCL 429030000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** stack monolithic manuf; oxide

fuel cell stack monolithic

IT **Fuel cells**

(solid-oxide, stacks, manuf. of monolithic)

L71 ANSWER 10 OF 10 HCA COPYRIGHT 2004 ACS on STN

63:52170 Original Reference No. 63:9463b-e **Fuel cell**

battery with auxiliary oxidation-reduction system. (Societe Generale de Constructions Electriques et Mecaniques (Alsthom)). NL 6411011 19650420, 8 pp. (Unavailable). PRIORITY: FR 19631018.

AB The **fuel cell** battery consisted of a large no.

of cells contg. 2 semicells each provided with an electrode rotated by 90° with respect to each other around the longitudinal **axis** of the battery. The elements of the cells are provided with slits which after assembly form **channels** constituting a single longitudinal supply line and a single longitudinal outlet line for all semicells oriented in the same direction. The electrodes, located between a semipermeable membrane, sepg. 2

semicells of the same cell, and a **separator**, isolating 2 succeeding cells, consisted of a flat circumferential frame with a central open construction of a metal or plate netting of the same material as that of the circumferential frame. The electrode was placed between 2 identical side frames sealing it off tightly from the adjacent elements, a semipermeable membrane, and a **separator**. The thickness of the open central construction of the electrode was equal to the sum of the thicknesses of the circumferential electrode frame and the 2 side frames. The side frames of a given semicell contained 2 slits so that the electrolyte bypassed the electrode of the respective semicell, and was transported to the next electrode. The semipermeable membrane and the **separator** contained 4 slits forming the supply and outlet lines. The transport of the electrolyte was possible by the openings present over the total length of the 2 opposite sides of the inner circumference of the side frames.

IC H01M
 CC 15 (Electrochemistry)
 IT **Cells**, voltaic
 (fuel, with auxiliary oxidn.-redn. system)

=> file wpix

FILE 'WPIX' ENTERED AT 16:24:33 ON 02 MAR 2004
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FILE LAST UPDATED: 26 FEB 2004 <20040226/UP>
 MOST RECENT DERWENT UPDATE: 200414 <200414/DW>
 DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

=> d 173 1-14 max

L73 ANSWER 1 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2003-833434 [77] WPIX
 DNN N2003-666296 DNC C2003-234406
 TI Electrode plate for **fuel cell** has opposing first
 and second surfaces one of which has open-faced channels each having
 inlet and outlet ends.
 DC A85 L03 X16
 IN EGAN, J F; FARRIS, P; MASTON, V A
 PA (EGAN-I) EGAN J F; (FARR-I) FARRIS P; (MAST-I) MASTON V A; (NEWE-N)
 NEW ENERGY SOLUTIONS INC
 CYC 102
 PI WO 2003077341 A2 20030918 (200377)* EN 26p H01M008-00
 RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT
 KE LS LU MC MW MZ NL OA PT SD SE SI SK SL SZ TR TZ UG ZM ZW
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ

DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
 KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
 NO NZ OM PH PL PT RO RU SC SD SE SG SK SL TJ TM TN TR TT TZ
 UA UG UZ VC VN YU ZA ZM ZW

US 2003186107 A1 20031002 (200377) H01M004-86

ADT WO 2003077341 A2 WO 2003-US6072 20030228; US 2003186107 A1
 Provisional US 2002-361680P 20020304, US 2003-376144 20030228

PRAI US 2002-361680P 20020304; US 2003-376144 20030228

IC ICM H01M004-86; H01M008-00

ICS H01M004-96; H01M008-08

AB WO2003077341 A UPAB: 20031128

NOVELTY - An electrode plate has opposing first and second surfaces. The surface(s) has open-faced channels each having an inlet end and an outlet end.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for:

(a) a **fuel cell** comprising: an anode electrode plate (46); a cathode electrode plate (48); and an electrolyte (50) located between the anode and cathode electrode plates; and

(b) a **fuel cell** stack comprising, in cooperative combination, **fuel cells** as above.

Each electrode plate has the opposing first and second surfaces, and is adjacent to the electrolyte.

USE - For a **fuel cell**, e.g. an acid **fuel cell** (i.e., a sulfuric acid **fuel cell**). (all claimed)

ADVANTAGE - The inventive plate serves to direct and distribute coolant fluids, thus increasing the degree and rate of heat transfer within the **fuel cell**. It serves to direct and distribute reactant fluids within the **cell**. The **fuel cell** utilizing the inventive plate provides a more efficient, high power density and has an extended practical operating range. It has a useful life that is not limited in terms of platform size or area.

DESCRIPTION OF DRAWING(S) - The figure is an off-axis top view of a **fuel cell** employing a double-sided channeled anode and cathode electrode plate.

Anode electrode plate 46

Cathode electrode plate 48

Electrolyte 50

First surfaces 52, 56

Second surfaces 54, 58

Open-faced channels 60, 62, 66, 72

Recessed portion 64, 70

Fibrous composite material 68, 74

Dwg.7/9

TECH WO 2003077341 A2UPTX: 20031128

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred

Component: The first surface is a planar surface. The planar first surface is coated with a catalyst. It has open-faced channels, and a recessed portion (64, 70) with a fibrous composite material (68, 74). The channeled first surface is coated with the catalyst. Flow fields formed by the open-faced channels (60, 62, 66, 72) of the first and second surfaces are parallel or perpendicular to flow fields formed by the open-faced channels of the second surface. The recessed portion of the first surface has open-faced channels. The electrode plate can be an anode electrode plate or a cathode electrode plate. The anode and cathode electrode plates have opposing first and second surfaces. The first surfaces (52, 56) of both anode and cathode electrode plates have the recessed portion with the open-faced channels and the fibrous composite material. The second surfaces (54, 58) of both anode and cathode electrode plates have the open-faced channels.

The electrolyte comprises an absorptive **separator** and an electrolyte; or a non-absorptive **separator** and a gelled electrolyte.

The absorptive **separator** is a non-woven sheet formed from fibers from fine glass fibers and/or inorganic fibers that have been rendered hydrophilic.

The non-absorptive **separator** is glass fiber leaf type **separators**, polyvinyl chloride leaf type **separators**, cellulosic leaf type **separators**, synthetic pulp leaf type **separators**, or phenol formaldehyde resin **separators**.

Preferred Material: The fibrous composite material is a **carbon** fiber composite material or a polytetrafluoroethylene fiber composite material. The **carbon** fiber composite material is a rigid, open, monolithic structure with high permeability.

Preferred Property: The electrode plate has a degree of porosity of 60-90%.

FS CPI EPI

FA AB; GI

MC CPI: A12-E06A; A12-E06B; L03-E04B; L03-E04G

EPI: X16-C15; X16-E06A; X16-K

PLE UPA 20031128

[1.1] 018; R00338 G0544 G0022 D01 D12 D10 D51 D53 D58 D69 D82 C1
7A; H0000; P1796 P1809

[1.2] 018; G3634-R D01 D03 D11 D10 D23 D22 D31 D42 D76 F24 F34
H0293 P0599 G3623

[1.3] 018; R00868 G1105 G1092 D01 D19 D18 D31 D50 D76 D86 F31
F30; R00001 G1503 D01 D50 D81 F22; P0226 P0282-R D01 D18
F30; H0022 H0011; P0293

[1.4] 018; Q9999 Q7410 Q7330; ND01

[2.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A;
H0000; S9999 S1070-R; P0511

[2.2] 018; Q9999 Q7410 Q7330; ND01
 [2.3] 018; Q9999 Q7409 Q7330; B9999 B5221 B4740

L73 ANSWER 2 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 2003-629057 [60] WPIX
 DNN N2003-500706 DNC C2003-172058
 TI Polymer electrolyte **fuel cell**, for co-generation
 system and mobile electric power generators for e.g. automobiles,
 has gas diffusion electrodes, each comprising gas diffusion layer
 having porous supporting carbon body.
 DC A85 L03 X16
 IN NIIKURA, J; SAKAI, O; TAKEBE, Y; UCHIDA, M; YAMAMOTO, M; YOSHIDA, A
 PA (MATU) MATSUSHITA ELECTRIC IND CO LTD; (MATU) MATSUSHITA DENKI
 SANGYO KK
 CYC 34
 PI EP 1298745 A2 20030402 (200360)* EN 39p H01M004-86
 R: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LT LU
 LV MC MK NL PT RO SE SI SK TR
 CN 1411089 A 20030416 (200360) H01M008-02
 JP 2003173788 A 20030620 (200360) 15p H01M004-96
 JP 2003173789 A 20030620 (200360) 9p H01M004-96
 KR 2003027802 A 20030407 (200360) H01M004-86
 US 2003064279 A1 20030403 (200360) H01M004-94
 ADT EP 1298745 A2 EP 2002-256655 20020925; CN 1411089 A CN 2002-151479
 20020928; JP 2003173788 A JP 2002-281128 20020926; JP 2003173789 A
 JP 2002-281064 20020926; KR 2003027802 A KR 2002-58770 20020927; US
 2003064279 A1 US 2002-253513 20020925
 PRAI JP 2001-301734 20010928; JP 2001-301730 20010928
 IC ICM H01M004-86; H01M004-94; H01M004-96; H01M008-02
 ICS H01M008-10
 AB EP 1298745 A UPAB: 20030919
 NOVELTY - A **fuel cell** comprises a pair of gas
 diffusion electrodes having a pair of catalyst layers and a pair of
 gas diffusion layers. Each gas diffusion layer comprises a porous
 supporting carbon body. The **fuel cell** also
 includes ion conductive polymer electrolyte membrane and a pair of
separator plates. Gas flow **channels** are provided
 to face the pair of gas diffusion electrodes, respectively.
 DETAILED DESCRIPTION - A polymer electrolyte **fuel**
cell consists of an ion conductive polymer electrolyte
 membrane, a pair of gas diffusion electrodes provided to sandwich
 the polymer electrolyte membrane to form a polymer electrolyte
 membrane-electrode assembly, and a pair of **separator**
 plates provided to sandwich the membrane-electrode assembly at the
 pair of gas diffusion electrodes. Gas flow channels are provided to
 face the pair of gas diffusion electrodes, respectively. Each gas
 flow channel has an inlet and an outlet. The pair of gas diffusion
 electrodes respectively has a pair of catalyst layers to contact the

polymer electrolyte membrane and a pair of gas diffusion layers to contact the catalyst layers. Each gas diffusion layer comprises a porous supporting carbon body having first and second porous carbon layers with the first porous carbon layer facing corresponding one of the catalyst layers. The first porous carbon layer has a larger number of smaller pores compared with the second porous carbon layer.

USE - Co-generation system and mobile electric power generators for e.g. automobiles.

ADVANTAGE - Water exhaustion and water retention in thickness direction of gas diffusion layer are achieved.

DESCRIPTION OF DRAWING(S) - The figure is an oblique view of a carbon cloth.

Wefts 20a, 20b

Warps 20c, 20d

Dwg.2/16

TECH EP 1298745 A2 UPTX: 20030919

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred

Components: Each porous supporting carbon body comprises carbon cloth. The first and second porous carbon layers comprise first carbon cloth and second carbon cloth made of first and second threads, respectively. The first carbon cloth has finer mesh than that of the second carbon cloth. The first porous carbon layer comprises carbon unwoven fabric and the second porous carbon layer comprises carbon cloth. The first and second porous carbon layers may comprise first and second layers of wefts (20a, 20b), respectively. The first and second layers of wefts are woven by common warps (20c, 20d) in a manner that the first layer has a shorter average interweft distance than that of the second layer of wefts.

In one of the conductive layers, the conductive **carbon particles** comprise first **carbon particles** and second **carbon particles** having larger amount of acidic function groups than that of the first **carbon particles**. The weight ratio of second **carbon particles** relative to the first **carbon particles** increases from one end of the gas diffusion layer corresponding to the inlet of flow channel to the other end of gas diffusion layer corresponding to the outlet of gas flow channel. The weight ratio of second polymer material relative to the first polymer material increases from one end of the gas diffusion layer corresponding to the inlet of flow channel to the other end of gas diffusion layer corresponding to the outlet of gas flow channel. Preferred Properties: Each porous supporting carbon body has water repellent property.

TECHNOLOGY FOCUS - POLYMERS - Preferred Material: Each diffusion layer comprises an electrically conductive layer comprising polymer

material (preferably fluorocarbon resin) and electrically conductive **carbon particles**. In one of the conductive layers, the polymer material comprises first polymer material, and second polymer material having lower degree of crystallinity and higher coefficient of moisture permeability than that of the first polymer material.

FS CPI EPI

FA AB; GI

MC CPI: A09-A03; A12-E06; L03-E04B

EPI: X16-C01; X16-E06A

PLE UPA 20030919

[1.1] 018; P0500 F- 7A

[1.2] 018; ND01; K9416; Q9999 Q7410 Q7330; Q9999 Q8060; B9999
B3269 B3190; Q9999 Q9234 Q9212; Q9999 Q9289 Q9212; B9999
B4795 B4773 B4740; B9999 B4717 B4706 B4568; Q9999 Q7432
Q7421 Q7330

[1.3] 018; R01669 D00 D09 C- 4A; A999 A135; S9999 S1456-R; B9999
B3269 B3190

L73 ANSWER 3 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-443465 [42] WPIX

DNN N2003-354013 DNC C2003-117665

TI Injection molding compound for manufacture of **fuel cell separator**, contains filler adhering to circumference of substance obtained by granulating mixture of specific amounts of thermosetting resin and **carbon powder**.

DC A32 A86 L03 X16

PA (NISN) NISSHINBO IND INC

CYC 1

PI JP 2002280010 A 20020927 (200342)* 7p H01M008-02

ADT JP 2002280010 A JP 2001-78205 20010319

PRAI JP 2001-78205 20010319

IC ICM H01M008-02

ICS B29C045-00; C08J003-12; C08K003-04; C08L101-00; H01M008-10

ICI B29K103:04, B29K105:16

AB JP2002280010 A UPAB: 20030703

NOVELTY - An injection molding compound (I) contains filler adhering to circumference of **carbon-resin mixed granulated** substance obtained by mixing 10-25 mass parts of thermosetting resin and 100 mass parts of **carbon powder** and **granulation**. The filler is chosen from silica, alumina, magnesium oxide, calcium carbonate, mica and/or graphite.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

(1) Manufacture of a **fuel cell separator** which involves injection molding of the compound (I); and

(2) **Fuel cell separator** which has groove for supplying and ejecting gas, on or both sides.

USE - For manufacture of a **fuel cell separator** (claimed).

ADVANTAGE - The **fuel cell separator** with high quality and electroconductivity, is obtained using injection molding compound.

Dwg.0/2

TECH JP 2002280010 AUPTX: 20030703

TECHNOLOGY FOCUS - POLYMERS - Preferred Properties: The **carbon-resin mixed granulated** substance has mean particle diameter of 100-700 μm and moisture content after drying of 5% or less. The injection molding compound has repose angle of 30-37degrees. The **fuel cell separator** has specific resistance measured according to JIS H0602 of 30 mOMEGA.cm or less. The thermosetting resin in the injection molding compound is thermosetting resin liquid.

ABEX JP 2002280010 AUPTX: 20030703

EXAMPLE - Zinc stearate (in mass parts) (1.2), internal mold releasing agent, liquid resol group phenol resin (20) and scale-like graphite (100) with mean particle diameter of 30 μm , were mixed and granulated to obtain carbon-resin mixed granulated substance. The granulated substance was dried until the moisture content was 2.9%. Aluminum oxide (7) was added to granulated substance (100) and an injection molding compound was obtained. The injection molding compound had excellent moldability. The injection molding compound was molded to obtain a fuel cell separator. The fuel cell separator had specific resistance of 17 mOMEGA.cm.

FS CPI EPI

FA AB

MC CPI: A08-R01; A11-B12A; A12-E06B; L03-E04G
EPI: X16-C16

PLE UPA 20030805

[1.1] 018; H0328; S9999 S1456-R

[1.2] 018; N9999 N6144; N9999 N6484-R N6440; Q9999 Q7410 Q7330;
B9999 B5209 B5185 B4740; N9999 N6780-R N6655; B9999 B3714
B3690; ND07

[1.3] 018; G3010 D00 F80 Al 3A Si 4A O- 6A; R01669 D00 D09 C-
4A; R01694 D00 F20 O- 6A Si 4A; R01544 D00 F20 Al 3A O-
6A; R01510 D00 F20 Mg 2A O- 6A; R01278 D00 F44 C- 4A O- 6A
Ca 2A; R01778 D00 D09 C- 4A; A999 A237; S9999 S1514 S1456;
A999 A771

L73 ANSWER 4 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-341582 [32] WPIX

DNN N2003-273247 DNC C2003-089583

TI **Fuel cell** apparatus has configuration that is tilted such that inlets for particles and gas are positioned at

higher elevation than outlets for carbon dioxide gas, excess molten electrolyte and gaseous by-product.

DC L03 X16
 IN CHEREPY, N; COOPER, J F; KRUEGER, R L
 PA (REGC) UNIV CALIFORNIA
 CYC 100
 PI US 2003017380 A1 20030123 (200332)* 19p H01M008-14
 WO 2003083978 A2 20031009 (200376) EN H01M008-00
 RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
 MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW
 W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
 DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
 KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
 NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ
 UA UG UZ VN YU ZA ZM ZW
 ADT US 2003017380 A1 Provisional US 2001-298293P 20010613, US
 2002-170879 20020612; WO 2003083978 A2 WO 2002-US18720 20020613
 PRAI US 2001-298293P 20010613; US 2002-170879 20020612
 IC ICM H01M008-00; H01M008-14
 ICS H01M004-86; H01M004-96
 AB US2003017380 A UPAB: 20030522

NOVELTY - A tilted **fuel cell** apparatus includes inlet for particles, inlet for gas containing oxygen and carbon dioxide towards cathode channels, outlet for carbon dioxide gas and excess molten electrolyte, outlet for gaseous by-product and excess molten electrolyte.

The cell assembly has configuration that is tilted such that the inlets are positioned at a higher elevation than the outlets.

DETAILED DESCRIPTION - A tilted **fuel cell** apparatus comprises anode current collector (26), cathode current collector (28), porous ceramic **separator**, anode plate and rib assembly, cathode plate and rib assembly, inlet for particles (22), inlet for gas (30) containing oxygen and carbon dioxide towards cathode channels, outlet for carbon dioxide gas and excess molten electrolyte, outlet for gaseous by-product and excess molten electrolyte.

The **separator** is sandwiched between the cathode and anode current collectors. The anode current collector is at higher elevation than the cathode current collector. The anode (cathode) plate and rib assembly is positioned such that the ribs are electrically connected to the anode (cathode) current collector to form anode (cathode) channels.

The **particles** comprises **carbon** and/or electrolyte (24). The cell assembly is planar and rectangular and tilted at acute angle to the horizontal in a configuration such that the inlets are positioned at a higher elevation than the outlets and that the anode plate and rib assembly is positioned at higher elevation than the cathode plate and rib assembly.

USE - As **fuel cell** or battery.

ADVANTAGE - The apparatus is capable of directly converting carbon fuel to electrical energy. Its configuration minimizes the electrical resistance between one cell and other connected in electrical series. Its configuration further allows continuous refueling of carbon fuel.

DESCRIPTION OF DRAWING(S) - The drawing shows a cross-sectioned view of a electrochemical cell.

Particles 22

Electrolyte 24

Anode current collector 26

Cathode current collector 28

Gas 30

Dwg.1/13

TECH US 2003017380 A1UPTX: 20030522

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred

Parameters: The acute angle is 15-60degrees to the horizontal.

Preferred Components: The carbon electrolyte mixture is entrained in a carrier gas. The apparatus further comprises pressure-driven convection or thermally-driven convection for flowing the oxygen-containing gas through the cathode **channels**. The porous **separator** is saturated with molten electrolyte during operation. The anode current collector is a porous metal structure that will not melt at the operating temperature of the cell or porous metalloid structure that will not melt at the operating temperature of the cell. The anode/cathode current collector comprises grid, felt, screen, foam, mesh, sponge or sintered frit.

TECHNOLOGY FOCUS - CERAMICS AND GLASS - Preferred Components: The porous ceramic **separator** is non-reactive metal oxide such as zirconium oxide, magnesium oxide, lithium-aluminum oxide, calcium oxide, aluminum oxide, and/or rare earth oxides.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Components: The carrier gas is inert gas, unreactive gas or sparsely reactive gas. The inert gas is helium, neon or argon. The unreactive gas is nitrogen. The sparsely reactive gas is carbon dioxide or carbon monoxide. The anode plate, cathode plate, and ribs comprise a metal, metal alloy, metalloid or graphite. The gas containing oxygen and carbon dioxide comprises air mixed with carbon dioxide such that the ratio of carbon dioxide to oxygen is 0.5-4.

The electrolyte comprises a metal carbonates, such as lithium carbonate, potassium carbonate or sodium carbonate. The metal carbonates comprise 38% lithium carbonate and 62% potassium carbonate. The cathode current collector comprises nickel, gold, silver, platinum, palladium, copper, cobalt or their alloys and iron alloys.

TECHNOLOGY FOCUS - TEXTILES AND PAPER - Preferred Components: The non-reactive metal oxide is constructed in the form of cloth, felt, fabric, porous planar plate or porous tubular plate.

FS CPI EPI

FA AB; GI

MC CPI: L03-E04C

EPI: X16-C02; X16-E06

L73 ANSWER 5 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-097008 [09] WPIX

DNN N2003-076992 DNC C2003-024874

TI **Fuel cell** has catalyst layer comprising noble metals, electroconductive **carbon particles** or electroconductive **carbon** fiber, hydrogen-ion conducting polyelectrolyte and metallic oxide particle.

DC L03 X16

PA (MATU) MATSUSHITA DENKI SANGYO KK

CYC 1

PI JP 2002289201 A 20021004 (200309)* 6p H01M004-86

ADT JP 2002289201 A JP 2001-86989 20010326

PRAI JP 2001-86989 20010326

IC ICM H01M004-86

ICS H01M008-04; H01M008-10

AB JP2002289201 A UPAB: 20030206

NOVELTY - The **fuel cell** has an electroconductive **separator** and an electrode which comprises a polymeric electrolyte film, a catalyst layer and a gaseous diffusion layer which are laminated sequentially. The catalyst layer has noble metal, electroconductive **carbon particles** or electroconductive **carbon** fiber, hydrogen ion conducting polyelectrolyte and metallic oxide particle.

DETAILED DESCRIPTION - A positive and negative electrodes are arranged on either sides of a polymeric electrolytic film through an electroconductive **separator**. Multiple **grooves** are cut in the **separators** for supplying heating gas containing hydrogen and oxidizing-agent gas in particular direction at the electrodes respectively. A gaseous-diffusion layer is interposed between the catalyst layer and **separator**.

USE - **Fuel cell**.

ADVANTAGE - A **fuel cell** with excellent durability is obtained.

DESCRIPTION OF DRAWING(S) - The figure shows the graph representing the operational characteristics of the **fuel cell**.

Dwg.3/3

FS CPI EPI

FA AB; GI

MC CPI: L03-E04A2

EPI: X16-C01C; X16-C09

L73 ANSWER 6 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-048356 [05] WPIX
DNN N2003-038067 DNC C2003-012578
TI Expanded **carbon** fiber product, for use as e.g. support for
catalytic metal, comprises gaps between hexagonal **carbon**
layers larger than gaps during vapor growth.
DC A60 E36 F01 J04 L02 L03 P73 X16
IN ENDO, M; YANAGISAWA, T
PA (COLL-N) COLLIS CO LTD; (ENDO-I) ENDO M; (GSIC-N) GSI CREOS CORP;
(GNZE) GUNZE SANGYO KK
CYC 29
PI EP 1243676 A2 20020925 (200305)* EN 22p D01F009-127
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR
US 2002136881 A1 20020926 (200305) D01F009-12
CN 1382849 A 20021204 (200322) D01F009-12
JP 2003147643 A 20030521 (200342) 8p D01F009-127
ADT EP 1243676 A2 EP 2002-6390 20020321; US 2002136881 A1 US 2002-98440
20020318; CN 1382849 A CN 2002-107498 20020321; JP 2003147643 A JP
2002-46780 20020222
PRAI JP 2002-46780 20020222; JP 2001-81738 20010321; JP 2001-260410
20010829
IC ICM D01F009-12; D01F009-127
ICS B32B005-02; C01B031-02; C08K007-06; C30B029-62
AB EP 1243676 A UPAB: 20030121
NOVELTY - An expanded **carbon** fiber product comprises a
vapor grown coaxial stacking morphology of truncated conical tubular
graphene layers. Each layer has at least part of gaps between
hexagonal **carbon** layers larger than the gaps between the
hexagonal **carbon** layers at the time of vapor growth.
DETAILED DESCRIPTION - An expanded **carbon** fiber
product comprises a vapor grown coaxial stacking morphology of
truncated conical tubular graphene layers. Each layer includes a
hexagonal **carbon** layer (10) and has a large ring end at
one end and a small ring end at the other end in **axial**
direction. At least part of edges of the hexagonal **carbon**
layers is exposed at the large ring ends. At least part of gaps
between the hexagonal **carbon** layers is larger than the
gaps between the hexagonal **carbon** layers at the time of
vapor growth.
USE - The expanded **carbon** fiber product is for mixing
with a metal or resin base material of a composite (claimed). It may
be used as a support for catalytic metal or as a **carbon**
intercalation compound. It may be used as an anode material or
additive to the anode material of primary and secondary lithium
batteries, components of **fuel cells**

(high-polymer electrolyte membrane, catalyst support, separator).

ADVANTAGE - The expanded **carbon** fiber product allows the gaps between hexagonal **carbon** layers to be larger than the gaps at the time of vapor growth.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic view of an enlarged transmission electron micrograph of a **carbon** fiber having a herring-bone structure manufactured by a vapor growth process.

Hexagonal **carbon** layer 10

Dwg.3/17

TECH EP 1243676 A2 UPTX: 20030121

TECHNOLOGY FOCUS - TEXTILES AND PAPER - Preferred Property: The expanded **carbon** fiber product has a bulk density of at most 0.010 g/cm³.

Preferred Components: At least part of the gaps between the hexagonal **carbon** layers is 100-1000 times larger than the gaps between the hexagonal **carbon** layers at the time of vapor growth. One to several tens of thousands of the hexagonal **carbon** layers are stacked. Catalytic metal is supported on the exposed edges of the hexagonal **carbon** layers. At least part of the hexagonal **carbon** layers is exposed at the small ring ends.

TECHNOLOGY FOCUS - POLYMERS - Preferred Materials: The expanded **carbon** fiber product which may be mixed with resin materials, e.g. polyethylene, polypropylene, nylon, fluororesins (e.g. polytetrafluoroethylene), polyesters, polyimides, or polycarbonates to form a composite is disclosed.

KW [1] 2211-0-0-3 CL PRD; 140-0-0-0 CL; 104333-0-0-0 CL; 102573-0-0-0 CL; 104471-0-0-0 CL; 104401-0-0-0 CL; 8-0-0-0 CL; 7382-0-0-0 CL

FS CPI EPI GMPI

FA AB; GI; DCN

MC CPI: A08-R03A; E31-N01; F01-D09A; J04-E03; L02-H04; L03-J; N02-F; N06-F

EPI: X16-A02A; X16-B01F1; X16-C01C; X16-E01; X16-E06A; X16-F02
DRN 0306-S; 0306-U; 0323-S; 0323-U; 0975-S; 0975-U; 2035-S; 2035-U

PLE UPA 20030121

[1.1] 018; R00326 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53 D58
D82; H0000; K9892; P1150; P1161

[1.2] 018; R00964 G0044 G0033 G0022 D01 D02 D12 D10 D51 D53 D58
D83; H0000; K9892; P1150; P1343

[1.3] 018; P1934-R P0635 D01 D50 F70; K9892

[1.4] 018; P0500 F- 7A; K9892

[1.5] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A;
H0000; K9892; P0511

[1.6] 018; P0839-R F41 D01 D63; K9892

[1.7] 018; P1081-R F72 D01; K9892

[1.8] 018; P0862 P0839 F41 F44 D01 D63; K9892
[1.9] 018; ND00; Q9999 Q7249
[1.10] 018; R05086 D00 D09 C- 4A; A999 A419; B9999 B4842 B4831
B4740

CMC UPB 20030121

M3 *01* C106 C730 C810 M411 M720 M904 M905 N104 N203 N204 N209 N212
N213 N221 N224 N514 N515 Q130 Q323 Q423 Q454 Q606 R042
DCN: R05086-K; R05086-P
M3 *02* A678 C810 M411 M730 M904 M905 Q421
DCN: R03247-K; R03247-C
M3 *03* H6 H601 H607 H609 H684 H689 H7 H721 M280 M312 M321 M332
M344 M363 M391 M423 M730 M904 M905 M910
DCN: R00975-K; R00975-S
M3 *04* H1 H100 H181 J0 J014 J1 J171 J3 J373 M280 M314 M315
M316 M323 M332 M342 M381 M382 M383 M393 M423 M510 M520 M530
M540 M620 M730 M904 M905 M910
DCN: R02035-K; R02035-S
M3 *05* H7 H721 M210 M213 M231 M320 M423 M510 M520 M530 M540 M610
M730 M904 M905 M910
DCN: RA009X-K; RA009X-S
M3 *06* H7 H721 M210 M212 M320 M423 M510 M520 M530 M540 M610 M730
M904 M905 M910
DCN: RA009Z-K; RA009Z-S
M3 *07* G000 G100 M280 M320 M414 M510 M520 M531 M540 M610 M730 M904
M905 M910
DCN: R00306-K; R00306-S
M3 *08* M210 M211 M320 M416 M610 M620 M730 M904 M905 M910
DCN: R00323-K; R00323-S

L73 ANSWER 7 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-627644 [67] WPIX

DNN N2002-496234 DNC C2002-177199

TI Composition for generating hydrogen, comprises carrier liquid,
dispersant and chemical hydride.

DC E17 E36 H06 L03 X16

IN KONDURI, R K; LARSEN, C A; MCCLAIN, A W; ROLFE, J L

PA (KOND-I) KONDURI R K; (LARS-I) LARSEN C A; (MCCL-I) MCCLAIN A W;
(ROLF-I) ROLFE J L; (SAFE-N) SAFE HYDROGEN LLC

CYC 101

PI WO 2002066369 A1 20020829 (200267)* EN 34p C01B003-08

RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW

W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ
UA UG US UZ VN YU ZA ZM ZW

US 2002166286 A1 20021114 (200277)

C10J001-00

EP 1355849 A1 20031029 (200379) EN C01B003-08

R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR

ADT WO 2002066369 A1 WO 2002-US923 20020111; US 2002166286 A1 Div ex US
1999-309198 19990510, CIP of US 2000-707105 20001106, Provisional US
2001-261600P 20010112, Provisional US 2001-261601P 20010112,
Provisional US 2001-261616P 20010112, US 2002-44813 20020111; EP
1355849 A1 EP 2002-720786 20020111, WO 2002-US923 20020111

FDT EP 1355849 A1 Based on WO 2002066369

PRAI US 2001-261616P 20010112; US 2001-261600P 20010112; US 2001-261601P
20010112; US 1999-309198 19990510; US 2000-707105 20001106; US
2002-44813 20020111

IC ICM C01B003-08; C10J001-00

ICS B01J007-00; C01B006-04; C01B006-24

AB WO 200266369 A UPAB: 20021018

NOVELTY - Composition comprises carrier liquid, dispersant and
chemical hydride.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the
following:

(1) A method for preparing the composition which involves
mixing chemical hydride with carrier liquid and triglyceride, and
grinding the resulting mixture to form a slurry;

(2) An apparatus comprising reservoir containing a chemical
hydride and a mechanism configured to introduce a reactant to
selected different portions of the chemical hydride to effect
hydrogen generating reactions at different locations within the
reservoir;

(3) Hydrogen fuel generation assembly comprising a reservoir
for a slurry comprising a carrier liquid, triglyceride dispersant
and chemical hydride, water reservoir, hydride reactor, tank for
receiving hydrogen, heat exchanger for receiving hydrogen from tank,
gas liquid **separator** for receiving hydrogen and water from
heat exchanger, conduit for conveying water from **separator**
to reservoir, and a conduit for conveying the dried hydrogen to
hydrogen-fueled power-producing device. The hydride reactor
communicates with the slurry reservoir and water reservoir, and
receives the slurry and water from the reservoirs, respectively, and
to mix the slurry and water to effect release of hydrogen from the
slurry. The tank also receives hydroxide by produced from reactor
and facilitates separation of hydrogen and hydroxyl byproduct. The
heat exchanger condenses water from hydrogen. The gas liquid
separator separates water from hydrogen and dispenses dried
hydrogen;

(4) A regeneration assembly for converting metal oxide and
hydroxide to elemental metals, comprises reactor to receive metal
hydroxide, **carbon**, unit for flowing gases comprising
carbon monoxide, hydrogen and elemental metal in gaseous
form, condenser to receive gases from reactor, **separator**

to receive elemental metals, their oxides and **carbon** from condenser, unit for flowing the elemental metal and **carbon** dissolving metal in liquid form from reactor to **separator**, and unit for flowing the metal oxide and the **carbon** dissolving metal from **separator** to reactor. The reactor retains a molten **carbon**-dissolving metal. The condenser discharges **carbon** monoxide and hydrogen from a first outlet, and elemental metal, metal oxide and **carbon** from the second outlet;

(5) Method for converting metal oxide and metal hydroxide group elemental metal involves charging a reactor having molten **carbon**-dissolving metal with metal hydroxide and **carbon**, flowing gases comprising elemental metal in gaseous form, **carbon** monoxide and hydrogen from reactor to condenser, condensing the flown gas, flowing condensate product to the **separator**; and

(6) Method for generating hydrogen fuel for a power-producing hydrogen-fueled device which involves mixing slurry of organic carrier liquid, triglyceride surfactant and chemical hydride with water to release hydrogen from slurry, removing water from the hydrogen released from the slurry, to form dried hydrogen and conveying dried hydrogen to the device for production of power.

USE - For generating hydrogen fuel for a power-producing hydrogen-fueled device (claimed).

ADVANTAGE - The slurry of carrier liquid, dispersant and chemical hydride can be safely stored and transported. Hydrogen can be easily extracted from the slurry for use as fuel. The slurry is not highly flammable or combustible and can be safely handled. The slurry is stable at normal temperature and pressure, because it is a liquid, and can be pumped through conduits. The reaction rate with the slurry can be easily controlled. The carrier liquid renders the slurry pumpable and as a safe liquid, simple to store or transport. The slurry has liquid-like flow characteristics and can be used for continuous formation of hydrogen. The reaction of the slurry may be stopped and started quickly and repeatedly without sacrificing control of the reaction or safety. The slurry in the form of continuous stream provides a path for dissipating heat generated from hydride/water reaction. The hydrogen production rate can be controlled by controlling the injection rate of water and hydride. The carrier slows the reaction rate when water is introduced into the hydride. The dispersant attaches to the particle of chemical hydride, increases the drag of particle in the carrier fluid and helps to prevent settling. The dispersant also helps to keep the particles from agglomeration, promotes slurry formation and stabilizes hydride ion into the mineral oil.

DESCRIPTION OF DRAWING(S) - The figure shows the hydride container with water feed tubes.

Dwg.1/5

TECH WO 200266369 A1UPTX: 20021018

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Compounds: The carrier liquid comprises an organic liquid such as light mineral oil, and hydrocarbon such as alkane chosen from pentane and hexane. Preferred Composition: The composition contains at least 40 weight% (wt.%), preferably more than 90 wt.% of chemical hydride. The composition contains 90-95 wt.% of oil coated chemical hydride particles. The composition comprises 5-10 wt.% of oil. Preferred Properties: The carrier liquid has viscosity of about 32-100, preferably 42-59 Saybolt Universal seconds (S.U.S) at standard temperature and pressure. The carrier liquid exhibits a flash point at preferably 154-177 degrees C.

TECHNOLOGY FOCUS - MECHANICAL ENGINEERING - Preferred Structure: The reservoir comprising chemical hydride is canister. The mechanism configured to introduce reactants comprises conduits that have open delivery ends arranged to introduce the reactant (water) to respective selective portion of the chemical hydride. The conduits are parallelly arranged or located at different distances along an **axis** of the reservoir. The mechanism can be moved relative to the chemical hydride contained in the reservoir. The conduit comprise needles, and a valving system. The reactor of hydrogen fuel generation assembly comprises a mixer. The fuel generation assembly further comprises a power-producing device chosen from **fuel cell**, internal combustion engine and external combustion engine; and conduit unit for conveying condensed water from **fuel cell** to reservoir.

ABEX WO 200266369 A1UPTX: 20021018

SPECIFIC COMPOUNDS - The chemical hydride is a light metal hydride chosen from lithium hydride, lithium borohydride, lithium aluminum hydride, sodium hydride, sodium borohydride, sodium aluminum hydride, magnesium hydride and calcium hydride, especially lithium or magnesium hydride. The dispersant is triglyceride of oleic acid.

KW [1] 97153-0-0-0 CL PRD; 143-0-0-0 CL; 670-0-0-0 CL; 273522-0-0-0 CL; 77-0-0-0 CL; 107320-0-0-0 CL; 674-0-0-0 CL; 660-0-0-0 CL; 647-0-0-0 CL; 3-0-0-0 CL

FS CPI EPI

FA AB; GI; DCN

MC CPI: E11-S; E31-A02; E31-A03; H06-A03; L03-E04F

EPI: X16-C; X16-C15

DRN 1532-P; 1532-U; 1740-S; 1740-U; 1997-S; 1997-U

CMC UPB 20021018

M3 *01* C101 C550 C810 M411 M424 M720 M740 M904 M905 N209 N262 N263
N513 N521 Q413 Q454

DCN: R01532-K; R01532-P

M3 *02* A103 A940 C101 C550 C730 C801 C802 C804 C805 C806 C807 M411
M730 M904 M905

DCN: R06784-K; R06784-S

M3 *03* A103 A940 B105 B720 B760 B809 B831 C101 C802 C804 C805 C806
C807 M411 M730 M904 M905
DCN: R03307-K; R03307-S

M3 *04* A103 A313 A940 A980 C101 C730 C801 C802 C804 C805 C806 C807
M411 M730 M904 M905
DCN: RA1JIU-K; RA1JIU-S

M3 *05* A111 A940 C101 C550 C730 C801 C802 C804 C805 C806 C807 M411
M730 M904 M905
DCN: R01700-K; R01700-S

M3 *06* A111 A940 B105 B720 B760 B809 B831 C101 C802 C804 C805 C806
C807 M411 M730 M904 M905 M910
DCN: R01997-K; R01997-S

M3 *07* A111 A313 A940 A980 C730 C801 C802 C803 C804 C805 C806 C807
M411 M730 M904 M905
DCN: R11862-K; R11862-S

M3 *08* A212 A940 C101 C550 C730 C801 C802 C804 C805 C806 C807 M411
M730 M904 M905
DCN: R05249-K; R05249-S

M3 *09* A220 A940 C101 C550 C730 C801 C802 C804 C805 C806 C807 M411
M730 M904 M905
DCN: R11058-K; R11058-S

M3 *10* C101 C108 C550 C730 C800 C801 C802 C804 C805 C807 M411 M730
M904 M905 M910
DCN: R01740-K; R01740-S

L73 ANSWER 8 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-511645 [55] WPIX

DNN N2002-404803 DNC C2002-145380

TI Conductive resin composition and **separator** for
fuel cell.

DC A85 L03 X12 X16

IN HAGIWARA, A; HORIE, N; IMASHIRO, Y; SAITO, K

PA (NISN) NISSHINBO IND INC; (HAGI-I) HAGIWARA A; (HORI-I) HORIE N;
(IMAS-I) IMASHIRO Y; (SAIT-I) SAITO K

CYC 2

PI JP 2002025340 A 20020125 (200255)* 13p H01B001-24

US 2002028368 A1 20020307 (200255) H01M008-02

ADT JP 2002025340 A JP 2000-201832 20000704; US 2002028368 A1 US
2001-897638 20010703

PRAI JP 2000-201832 20000704

IC ICM H01B001-24; H01M008-02

ICS C08K003-04; C08K005-29; C08L101-00; H01M008-10

AB JP2002025340 A UPAB: 20020829

NOVELTY - A conductive resin composition uses a conductive
carbon powder and a binder as its major
constituents. The binder uses a mixture of a thermoplastic resin and
a carbodiimide compound.

USE - The conductive resin composition is used for the

separator for the **fuel cell**. The method efficiently produces the **separator**. The **separator** is used for the macromolecular solid **fuel cell**.

ADVANTAGE - The **separator** has high elasticity, superior releasability, dimensional accuracy, and gas impermeability. The macromolecular solid **fuel cell** has low output in long-term continuous operation, no development of crazing, cracks in assembly, and high gas sealing and superior impact resistance.

Dwg.0/2

TECH JP 2002025340 AUPTX: 20020829

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - In a **separator** for a **fuel cell**, the conductive resin composition is molded to a **separator** shape having oxidant gas supply grooves or fuel gas supply grooves on the single surface or both the surfaces of the **separator**. The **separator** has a resistivity of 200 m-ohms.cm or less. The **separator** is produced by injection molding using a mixture formed by adding and mixing the carbodiimide compound, 0.001-50 parts by mass, the conductive **carbon powdered**, 100-1000 parts by mass, to and with the thermoplastic resin, 100 parts by mass. A macromolecular solid **fuel cell** has a pair of electrodes sandwiching a macromolecular solid electrolytic film, and juxtaposed unit cells. Each unit cell consists of a pair of **separators** forming **channels** for gas supply and discharge by sandwiching the pair of electrodes. The **separator** described above is used for part of the total **separators** or the entire total **separators** in the **fuel cell**.

FS CPI EPI

FA AB

MC CPI: A08-M09A; A09-A03; A11-B12A; A12-E06B; L03-E04G

EPI: X12-D01X; X16-C01C; X16-C16

PLE UPA 20021212

[1.1] 018; H0317

[1.2] 018; ND01; Q9999 Q7410 Q7330; B9999 B3269 B3190; B9999 B3849-R B3838 B3747; B9999 B4159 B4091 B3838 B3747

[1.3] 018; R05085 D00 D09 C- 4A; R01669 D00 D09 C- 4A; A999 A135

[1.4] 018; D01 C- 4A N- 5A; A999 A793

L73 ANSWER 9 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-420074 [45] WPIX

DNN N2002-330420 DNC C2002-118961

TI **Separator** used for solid polymer **fuel cells**, has mixture of graphite powder, thermosetting resin and carbon fiber in specific amount, and has specific volume resistivity.

DC A85 L03 X16

PA (KURE) KUREHA CHEM IND CO LTD

CYC 1

PI JP 2002025572 A 20020125 (200245)* 9p H01M008-02

ADT JP 2002025572 A JP 2000-208557 20000710

PRAI JP 2000-208557 20000710

IC ICM H01M008-02

ICS H01M008-10

AB JP2002025572 A UPAB: 20020717

NOVELTY - **Separator** has a mixture of 65-80 weight% of graphite powder, 15-30 wt.% of thermosetting resin and 5-15 wt.% of carbon fiber, and is formed into a sheet by compression molding.

Separator has **grooves** on one or both sides, and has volume resistivity of 10m Omega .cm or less.

DETAILED DESCRIPTION - Apparent density of **separator** is 1.4-2.1 dl/g. Aspect ratio of graphite powder is five or less.

Grooving separator has density difference between groove and rib portion. In **grooving separator** direction, volume resistivity at surface of molding is 1.0-1.5 times than thickness direction volume resistivity. **Grooving separator** has volume mean diameter of 30-70 mu m. In **grooving separator**, the amount of gas permeation is less than 10-3 cm2/sec. The thermal expansion coefficient of **grooving separator** at 80 deg. C is less than 50 multiply 10-6 k-1. The thickness of molding of **grooving separator** is 1-5 mm.

USE - For solid polymer **fuel cells** used in vehicles.

ADVANTAGE - The **separator** has low volume resistivity, low thermal expansion and low permeability, high strength, and is light in weight.

DESCRIPTION OF DRAWING(S) - The figure shows the top view of compression molding and expansion sectional view of a-b line. (Drawing includes non-English language text).

Dwg.4/8

TECH JP 2002025572 AUPTX: 20020717

TECHNOLOGY FOCUS - POLYMERS - Preferred compounds: The thermosetting resin, used is novolac type phenol resin.

FS CPI EPI

FA AB; GI

MC CPI: A08-R03; A08-R03A; A11-B11; A12-E06B; L03-E04G

EPI: X16-C01C; X16-F02

PLE UPA 20020906

[1.1] 018; H0328; P0226 P0282-R D01 D18 F30; S9999 S1581

[1.2] 018; ND01; Q9999 Q7341 Q7330; Q9999 Q7410 Q7330; Q9999 Q9289 Q9212; Q9999 Q9303 Q9212; B9999 B3190-R; K9892; K9449; N9999 N6462 N6440

[1.3] 018; R01778 D00 D09 C- 4A; A999 A237

[1.4] 018; R05086 D00 D09 C- 4A; A999 A419; S9999 S1070-R

L73 ANSWER 10 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-291840 [33] WPIX
DNN N2002-227872 DNC C2002-085678
TI Microcell assembly for electrochemical device e.g. **fuel**
cell, battery **cell**, has insulated microcell sheets
with bundled microcell fibers arranged in parallel.
DC A32 A85 L03 X16
IN ESHRAGHI, R R; ESHRAGUI, R
PA (MICR-N) MICROCELL CORP
CYC 97
PI WO 2002009212 A1 20020131 (200233)* EN 184p H01M002-18
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG UZ
VN YU ZA ZW
US 6338913 B1 20020115 (200233) H01M004-86
AU 2001082953 A 20020205 (200236) H01M002-18
US 6399232 B1 20020604 (200242) H01M002-18
US 6403248 B1 20020611 (200244) H01M006-44
US 6403517 B1 20020611 (200244) H01M004-88
US 6444339 B1 20020903 (200260) H01M008-04
US 6495281 B1 20021217 (200307) H01M002-18
EP 1316119 A1 20030604 (200337) EN H01M002-18
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR
KR 2003038678 A 20030516 (200359) H01M002-18
JP 2004505417 W 20040219 (200414) 201p H01M008-24
ADT WO 2002009212 A1 WO 2001-US23220 20010723; US 6338913 B1 US
2000-624070 20000724; AU 2001082953 A AU 2001-82953 20010723; US
6399232 B1 US 2000-621228 20000724; US 6403248 B1 US 2000-624303
20000724; US 6403517 B1 US 2000-625218 20000724; US 6444339 B1 US
2000-625219 20000724; US 6495281 B1 US 2000-621713 20000724; EP
1316119 A1 EP 2001-961707 20010723, WO 2001-US23220 20010723; KR
2003038678 A KR 2003-701123 20030124; JP 2004505417 W WO
2001-US23220 20010723, JP 2002-514817 20010723
FDT AU 2001082953 A Based on WO 2002009212; EP 1316119 A1 Based on WO
2002009212; JP 2004505417 W Based on WO 2002009212
PRAI US 2000-625219 20000724; US 2000-621228 20000724; US 2000-621713
20000724; US 2000-624070 20000724; US 2000-624303 20000724; US
2000-625218 20000724
IC ICM H01M002-18; H01M004-86; H01M004-88; H01M006-44; H01M008-04;
H01M008-24
ICS H01M002-20; H01M002-32; H01M004-04; H01M006-10; H01M008-02;
H01M008-06

AB WO 200209212 A UPAB: 20020524

NOVELTY - Several microcell sheets (60,62,64,66) have respective microcell fibers arranged in parallel and planar configuration. The inner current collectors of the fibers **axially** extend from one edge of the sheet, and the external current collectors contacting the upper microcell fiber layer extend from the opposite edge. The adjacent microcell sheets are separated by respective insulating sheets (94,96,98).

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

- (i) Microcell sub-bundle article;
- (ii) Series connected assembly of microcell sub-bundles;
- (iii) Microcell article;
- (iv) Microcell assembly fabrication method;
- (v) Microcell module fabrication method;
- (vi) Microcell sub-bundle article fabrication method;
- (vii) Microcell article fabrication method;
- (viii) Fibrous microcell structure fabrication method;
- (ix) Process system;
- (x) Fiber microcell article manufacturing process;
- (xi) Electrochemical cell module;
- (xii) Microcell module;
- (xiii) Electrochemical energy generation process;
- (xiv) Thermal management method of electrochemical cell module;
- (xv) Thermal management method of microcell module;
- (xvi) Electrochemical device;
- (xvii) **Fuel cell**;
- (xviii) Microcell structure;
- (xix) Electrochemical cell device manufacturing method;
- (xx) Fibrous microcell structure;
- (xxi) Water management method in electrochemical device;
- (xxii) Coated fiber;
- (xxiii) Corrosion-resistant fiber fabrication method.

USE - Microcell assembly for electrochemical device (claimed) such as **fuel cell** (claimed) and battery cell.

ADVANTAGE - Simplifies bundling of fibers in modular assemblies for battery cell applications. Provides compact unitary, overall construction which provides high density energy output and enables minimization of volume of the **fuel cell** or other electrochemical cell. The parallel connection provides very high current density per unit volume, allowing the assembly to operate at high voltage and high efficiency.

DESCRIPTION OF DRAWING(S) - The figure shows an exploded perspective view of microcell assembly.

Microcell sheets 60,62,64,66

Insulating sheets 94,96,98

Dwg.7/51

TECH WO 200209212 A1UPTX: 20020524

TECHNOLOGY FOCUS - POLYMERS - The porous membrane **separator** contacting the inner electrode of the microcell assembly, is coated with permselective membrane comprising a material selected from the group consisting of metals such as palladium and electrically conductive polymeric material, ion exchange polymer, glasses, ceramics and combinations.

The microcell precursor containing at least one current collector, is contacted with an electrocatalyst reducing agent comprising sodium hydroxide and hydrophobicity-imparting material comprising PTFE emulsion, fluoropolymer, polytetrafluoroethylene. The current collector is formed of a corrosion susceptible metal and coated with **carbonaceous** coating of pyrolyzed organic material.

FS CPI EPI

FA AB; GI

MC CPI: A12-E01; L03-E01D

EPI: X16-A01A; X16-B01; X16-C; X16-F02; X16-J09

PLE UPA 20020524

[1.1] 018; R00975 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A;
H0000; S9999 S1025 S1014; P0511

[1.2] 018; ND01; ND07; K9416; N9999 N7147 N7034 N7023; K9483-R;
K9676-R; K9712 K9676; Q9999 Q7330-R; Q9999 Q7341 Q7330;
Q9999 Q7410 Q7330; B9999 B5221 B4740

[1.3] 018; Q9999 Q7114-R; B9999 B3509 B3485 B3372

[2.1] 018; P0000

[2.2] 018; ND01; ND07; K9416; N9999 N7147 N7034 N7023; K9483-R;
K9676-R; K9712 K9676; Q9999 Q7330-R; Q9999 Q7341 Q7330;
Q9999 Q7410 Q7330; B9999 B5221 B4740

[2.3] 018; Q9999 Q7114-R; Q9999 Q7772; Q9999 Q8060

[3.1] 018; H0124-R

[3.2] 018; P0464-R D01 D22 D42 F47

[3.3] 018; P1592-R F77 D01

[3.4] 018; G0953 G0817 D01 D23 D22 D41 D51 D54 D57 D59 D75 F72
E00 E01; H0000; H0011-R

[3.5] 018; ND01; ND07; K9416; N9999 N7147 N7034 N7023; K9483-R;
K9676-R; K9712 K9676; Q9999 Q7330-R; Q9999 Q7341 Q7330;
Q9999 Q7410 Q7330; B9999 B5221 B4740

[3.6] 018; Q9999 Q7523; N9999 N7170 N7023

L73 ANSWER 11 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2002-034419 [04] WPIX

DNC C2002-009631

TI In situ treatment of coal formation, for production of hydrocarbons, hydrogen and/or other products, involves heating selected part of formation with controlled heat to produce mixture from formation.

DC E36 H09

IN BAXLEY, P T; BERCHENKO, I E; BIELAMOWICZ, L J; CARL, F G; COLES, J M; FOWLER, T D; HUNSUCKER, B G; KARANIKAS, J M; KEEDY, C R; MADGAVKAR, A M; MAHER, K A; MARTIN VAN HARDEVELD, R; MENOTTI, J L;

PIERRE DE ROUFIGNAC, E; RYAN, R C; SCHOELING, L; SHAHIN, G T;
 STEGEMEIER, G L; SUMNU-DINDORUK, M D; VINEGAR, H J; WARD, J M;
 WELLINGTON, S L; ZHANG, E

PA (SHEL) SHELL OIL CO

CYC 93

PI WO 2001081240 A2 20011101 (200204)* EN 569p C01B000-00

RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
 MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW

W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE
 DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG
 KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ
 PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG UZ VN YU
 ZA ZW

AU 2001059183 A 20011107 (200219) C01B000-00

ADT WO 2001081240 A2 WO 2001-US13538 20010424; AU 2001059183 A AU
 2001-59183 20010424

FDT AU 2001059183 A Based on WO 2001081240

PRAI US 2000-199215P 20000424; US 2000-199213P 20000424; US 2000-199214P
 20000424

IC ICM C01B000-00

AB WO 200181240 A UPAB: 20040128

NOVELTY - In situ treatment of coal formation involves transferring heat from one or more source to at least one selected part of the formation. The heat source is controlled such that the average temperature within much of the selected part of the formation is less than 375 deg. C. A mixture is hence produced from the formation.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for;

(1) Method of treating coal formation in situ by heating to oxidize hydrocarbons by flowing an oxidant through a conduit within the wellbore, reacting oxidant an hydrocarbon to generate heat that is used to pyrolyze part of hydrocarbons in pyrolysis zone;

(2) In situ production of hydrogen from a coal formation by heating the formation to produce a mixture with a hydrogen partial pressure greater than 0.5 bar;

(3) A method for forming heater wells in a coal formation, by forming a second wellbore using magnetic tracking, such that it is parallel to the first. At least one heater source is placed in each bore, to provide heat to at least part of the formation;

(4) A method of installing a heater well into a coal formation by drilling a bore using a steerable motor and an accelerometer;

(5) A system for heating a coal formation, comprising a heater, an oxidizing fluid source and a conduit to deliver the fluid to a reaction zone in the formation;

(6) A mixture produced from a section of a coal formation, comprising less than 10 wt.% olefin and an average carbon number of less than 35;

(7) Production of synthesis gas from a coal formation;

(8) A method of sequestering **carbon** dioxide within a coal formation by heating part of the formation to increase permeability, allowing it to cool and storing **carbon** dioxide within the section; and

(9) Production of ammonia from a coal formation by separating air into oxygen- and nitrogen-rich streams, heating the formation to produce synthesis gas from reaction between a gas generating fluid and the oxygen stream, separating into hydrogen and **carbon** dioxide, and forming ammonia from reaction of the nitrogen and hydrogen streams.

USE - For production of hydrocarbons, hydrogen and/or other products from coal formations.

ADVANTAGE - Concerns over depletion of available hydrocarbon resources have led to development for processes for more efficient recovery, processing and/or their use. Combusting a fuel, or oxidizing, to heat a formation may be more efficient than using solely electricity, since the electrical heaters can be selectively used. A significant number of coal formations are not suitable for economical mining, such as from steeply dipping coal seams, relatively thin coal seams less than 1m thick, and deep coal seams. In these cases, the electricity obtained from burning the mined coal is not as efficient as that obtained from other fuels. Further, coal combustion results in **carbon**, sulfur and nitrogen oxides being released to the atmosphere. In situ production of other products, such as synthesis gas, eliminates the expense of building, operating and maintaining a surface production facility. Sequestering fluid, resulting from various stages of the in situ process, in the underground formation, reduces the amount vented to the atmosphere as in previous processes. Temperature and pressure can be controlled during pyrolysis to yield improved and selected products from the formation. Controlling the heating of the formation can inhibit production of less desirable components. Similarly, a reducing agent can be used to the same effect. The positioning of heating sources can be designed to optimize heating for a section of the formation, thus allowing for a greater area of hydrocarbons for pyrolysis to increase the economic viability of in situ conversion. Cooling the formation can improve the strength of the rock in the formation, to prevent subsidence, and increase the absorptive capacity of the formation.

DESCRIPTION OF DRAWING(S) - The drawing shows heater wells in a coal formation.

steeply dipping coal formation 200
heater well 202

production well 206
Dwg.4/135

TECH WO 200181240 A2UPTX: 20020117

TECHNOLOGY FOCUS - MECHANICAL ENGINEERING - Preferred Heater: There are at least seven heat sources, which are electrical heaters,

surface heaters, flameless distributed heaters or natural distributed heaters. Heat sources are arranged in a repetitive pattern of units of at least three heaters, near the edge of the coal layer, where the amount of hydrocarbons produced per unit of energy input is increased, laterally spaced from the layer center, in a staggered line, or at the apexes of a regular hexagon, at the center of which is the production well. The bore in which the heat source is placed may be formed by geosteered drilling. The heating element is free to move **axially** within the bore to allow for thermal expansion of the heating element, which comprises a pipe in pipe heater, a flameless distributed combustor and a mineral insulated cable coupled to a support and suspended from a wellhead. The production well is less than 6 m (preferably less than 1.5 m) from a heat source, and a heating element is located in the production well. The heaters are at least 6m apart from each other, and production wells are at least 12m from each other. The heated section has a uniform temperature distribution, with the difference between highest and lowest temperatures of less than 200degreesC. The temperature at the center of a triangular unit is the same as that at an outer lateral boundary. These temperatures increase linearly after less than 3 months.

Preferred System: The conduit includes orifices through which oxidizing fluid is delivered at a rate to control oxidation rate in the formation. The conduit is cooled by the oxidizing fluid. It removes oxidation product, which transfers heat to the fluid. The oxidizing fluid is prevented from flowing in to the formation beyond the reaction zone, which is adjacent to the pyrolysis zone. The oxidizing fluid is heated using a heat exchanger, and as such is used to partly heat the formation. The section of the formation extends radially from the opening a width of less than 0.2 m. A steel overburden casing is coupled to the opening through which the heater is passed, and is cemented into an overburden in the formation. A packing material at the junction of the overburden casing and the opening prevents fluid flow between the opening and the casing during use. In a second conduit is placed a conductor, which can heat the formation during application of electrical current.

Preferred Conductor: The insulated conductor is supported, and includes a ceramic and/or stainless steel centraliser to maintain its relative position. The conductor is placed within a wellbore of at least 5 cm diameter. It is connected to a lead-in conductor comprising a rubber-insulated conductor or copper wire, using a cold pin transition conductor. This component is a low resistance insulated conductor, to generate no heat. The conductor is disposed in an electrically insulating material, itself placed in a sheath. The conductor comprises a copper-nickel alloy, with 7-12 wt.% or 2-6 wt.% nickel. The electrically insulating material comprises a thermal conductive material of magnesium oxide to a thickness of at

least 1mm, optionally with alumina. The magnesia comprises grain particles to occupy pores within the magnesia. The sheath comprises a corrosion resistant material, preferably stainless steel. With two additional insulated conductors, a 3-phase Y configuration results in series or parallel electrical connection. The insulated conductor generates a radiant heat of 500-1150 W/m during use. The support has holes to allow fluid flow, including flow of a corrosion inhibitor through a perforated tube in an open wellbore adjacent to the insulated conductor. A conductor is disposed in a conduit in which a thermally conductive fluid (preferably helium) is circulated to inhibit arcing between the conductor and the conduit, and to maintain a pressure balance to prevent deformation of the conduit. The conduit comprises two sections, where the thickness of one section is greater than the other, such that less heat is radiated from that section than that with the smaller thickness.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Formation: At least some of the hydrocarbons in the formation have an atomic hydrogen weight percentage of greater than 4%, or an atomic oxygen weight percentage of less than 15%. At least some of the hydrocarbons in the section have a vitrinite reflectance of greater than 0.3%, which is used for selecting the region for heating. The section comprises at least 5wt.% organic matter. At least some of the hydrocarbons in the section have an atomic hydrogen to **carbon** ratio between 0.7-1.65, or an atomic oxygen to **carbon** ratio of 0.025-0.15. At least part of the section has a moisture content of less than 15%. The formation is a deep coal formation over 760m below the surface. The permeability of the selected section is increased to greater than 100 millidarcy (from 10 millidarcy), uniformly increased.

Preferred Mixture: The produced mixture comprises condensable hydrocarbons with API gravity of at least 25degrees, or non-condensable hydrocarbons, with a molar ratio of ethene to ethane of 0.001-0.15. 0.1-15 wt.% of the hydrocarbons are olefins. Less than 0.1 (atomic) wt.% is nitrogen, oxygen or sulfur. 5-30 wt.% of the condensable hydrocarbons comprise cycloalkanes or oxygen-containing compounds, preferably phenols, greater than 20 wt.% aromatic compounds, less than 5 wt.% multi-ring aromatics with more than two rings or less than 0.3 wt.% asphaltenes. A non-condensable component comprises 10-80 vol.% hydrogen, with a partial pressure of 0.05 bar, measured when the mixture is at a production well. Greater than 0.05 wt.% of the produced mixture is ammonia, used to produce fertilizer. The produced mixture is separated into gas and fluid streams, and the latter is separated into aqueous and non-aqueous streams. Some hydrogen sulfide and/or **carbon** dioxide is separated from non-condensable hydrocarbons. The heat is controlled such that the mixture is produced as a vapor, and to yield at least 15wt.% of condensable hydrocarbons. Condensable hydrocarbons in the fluid comprises an

atomic hydrogen to **carbon** ratio of greater than 1.75. The produced mixture comprises non-condensable hydrocarbons with **carbon** number of less than 5. Synthesis gas produced has a hydrogen to **carbon** ratio of 2:1. The gas generating liquid comprises liquid water, steam or water and **carbon** dioxide. Produced gas is passed through a turbine to generate electricity, or into a **fuel cell** (preferably a molten carbonate or a solid oxide **fuel cell**) for the same purpose. **Carbon** dioxide is separated from the fluid entering the **fuel cell**, and is stored within a spent section of the formation. Part of the synthesis gas is combusted to heat the formation. Part of the synthesis gas produced is converted to methanol, gasoline or methane using catalytic processes. Some of the separated **carbon** dioxide is used as a flooding agent for enhanced oil recovery. Part of the condensable hydrocarbons are cracked to form middle distillates.

TECHNOLOGY FOCUS - CHEMICAL ENGINEERING - Preferred Heating: At least some coal is pyrolyzed by the heaters as the formation conditions are controlled within a pyrolysis temperature range. Heat is transferred by conduction. The minimum pyrolysis temperature is 270degreesC, and the maximum is 400 or 500degreesC. Heat is controlled to yield greater than 60 wt.% condensable hydrocarbons, as measured by Fischer Assay. When production of fluid falls below a desired production rate or quality, energy input is increased to raise the average section temperature. The formation is heated in a reducing environment for at least part of the time it is heated. An unpyrolyzed section is left between two heated sections to prevent subsidence of the formation. At least 20 wt.% of hydrocarbons within the selected area are pyrolyzed.

Preferred Condition: Temperature and pressure within the section are controlled as a function of each other, and pressure is controlled with a valve coupled to at least one of the heaters or a production well within the formation. The average heating rate of the section is less than 1degreesC per day. A selected volume (V) of the coal formations is heated. It has an average heat capacity (Cv), and the heating energy per day (Pwr) is no greater than $h \times V \times Cv \times \rho_B$, where h is an average heating rate of the formation, ρ_B is formation bulk density and the heating rate is less than 10degreesC per day. Thermal conductivity of at least part of the section is greater than 0.5 W per mdegreesC. Pressure is controlled at at least 2.0 bar absolute to inhibit production of hydrocarbons with **carbon** numbers greater than 25. Amount of condensable hydrocarbons in the produced mixture is controlled by controlling pressure within the formation from atmospheric pressure to 100 bar, as measured at the wellhead. Reduction of pressure increases production of condensable hydrocarbons and decreases API gravity, whereas an increase in pressure increases production of non-condensable hydrocarbons and reduces API gravity (sic).

Formation conditions are controlled by recirculating part of the hydrogen from the mixture into the formation. Hydrogen is provided to the heated section to hydrogenate hydrocarbons within the section and heating part of the section with resulting heat of hydrogenation. Hydrogenation may be conducted in a surface unit. The production well bore is heated to inhibit condensation of the mixture within the wellbore. Rate of fluid removal can be controlled to control the pressure-temperature relationship.

Preferred Synthesis: Air is separated cryogenically or by membrane separation. The ratio of hydrogen to nitrogen is 3:1. **Carbon** dioxide is separated from syngas by amine **separator**. Part of **carbon** dioxide and/or ammonia is used to produce urea.

Preferred Pressure: Pressure is controlled according to p greater than $ePOWER(-A/T + B - 2.6744)$, where p is pressure in bar absolute, T is temperature in K, and A and B are parameters greater than 10, selected according to characteristics of the coal formation, required olefin content and **carbon** number of pyrolyzed hydrocarbon fluids. API gravity of the produced mixture is controlled to be greater than 25degrees by controlling average pressure and temperature according to $p=ePOWER(-44000/T + 67)$, where p is measured in psia and T is measured in K. API can be controlled to be greater than 30degrees according to $p=ePOWER(-31000/T + 51)$, or greater than 35degrees according to $p=ePOWER(-22000/T + 38)$. Olefin weight percentage is less than 20 wt.%, using $p=ePOWER(-57000/T + 83)$, less than 10 wt.% by $p=ePOWER(-16000/T + 28)$, or less than 5wt.% by $p=ePOWER(-12000/T + 22)$. Weight percentage of hydrocarbons with **carbon** numbers greater than 25 can be controlled to be less than 25 wt.% by $p=ePOWER(-14000/T + 25)$, less than 20 wt.% by $p=ePOWER(-16000/T + 28)$, or less than 15 wt.% by $p=ePOWER(-18000/T + 32)$. Atomic hydrogen to **carbon** ratio can be controlled as greater than 1.7 according to $p=ePOWER(-38000/T + 61)$, greater than 1.8 according to $p=ePOWER(-13000/T + 24)$ or greater than 1.9 according to $p=ePOWER(-8000/T + 18)$.

Preferred Oxidation: Oxidation occurs at greater than 400degreesC. Reaction products are removed from the heat source zone. Excess oxidant is removed to maintain temperature of less than 1200degreesC. Oxidant is passed from conduit to heat source zone by diffusion. The oxidizing fluid oxidizes at least some of the hydrocarbons present in the formation.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Oxidant: The oxidant comprises hydrogen peroxide, air or a nitrogen-free fluid. TECHNOLOGY FOCUS - INSTRUMENTATION AND TESTING - Preferred Features: A temperature distribution is determined in the insulated conductor using an electromagnetic signal provided to the conductor. Leakage current from, electrical current or voltage applied to and temperature in the insulated conductor are monitored, the latter

with a thermocouple.

KW [1] 97153-0-0-0 CL PRD; 2211-0-0-0 CL PRD; 783-0-0-0 CL PRD;
12-0-0-0 CL PRD; 0052-99901 CL PRD; 0052-99902 CL PRD

[2] 97153-0-0-0 CL

[3] 2211-0-0-0 CL

FS CPI

FA AB; GI; DCN

MC CPI: E10-J02C3; E10-J02D; E31-A01; E31-N03; E32-A01; H09-A01A

DRN 1423-P; 1423-U; 1532-P; 1532-U; 1532-S; 1669-P; 1669-U; 1669-S;
1713-P; 1713-U

CMC UPB 20040128

M3 *01* C101 C550 C810 M411 M424 M720 M740 M904 M905 N513 Q418
DCN: R01532-K; R01532-P

M3 *02* C106 C810 M411 M424 M720 M740 M904 M905 M910 N513 Q418
DCN: R01669-K; R01669-P; R05085-K; R05085-P

M3 *03* C106 C108 C550 C730 C800 C801 C802 C803 C805 C807 M411 M424
M720 M740 M904 M905 M910 N343 N513 Q418
DCN: R01423-K; R01423-P

M3 *04* C500 C730 C800 C801 C802 C804 C806 C807 M411 M424 M720 M740
M904 M905 M910 N309 N361 N513 Q418
DCN: R01713-K; R01713-P

M3 *05* M210 M211 M212 M213 M214 M215 M216 M220 M221 M222 M223 M224
M225 M226 M231 M232 M233 M320 M416 M424 M610 M620 M720 M740
M904 M905 N311 N321 N513 Q418
DCN: 0052-99901-K; 0052-99901-P

M3 *06* H7 H721 M210 M211 M212 M213 M214 M215 M216 M220 M221 M222
M223 M224 M225 M226 M231 M232 M233 M320 M416 M424 M610 M720
M740 M904 M905 N513 Q418
DCN: 0052-99902-K; 0052-99902-P

M3 *07* C101 C550 C810 M411 M730 M904 M905
DCN: R01532-K; R01532-S

M3 *08* C106 C810 M411 M730 M904 M905 M910
DCN: R01669-K; R01669-S; R05085-K; R05085-S

L73 ANSWER 12 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-387138 [41] WPIX

DNN N2001-284713

TI Production of **separator** for **fuel cell**.

DC X16

PA (OSAG) OSAKA GAS CO LTD

CYC 1

PI JP 2001122677 A 20010508 (200141)* 7p C04B038-06

ADT JP 2001122677 A JP 1999-304055 19991026

PRAI JP 1999-304055 19991026

IC ICM C04B038-06

ICS H01M004-96; H01M008-02

AB JP2001122677 A UPAB: 20010724

NOVELTY - A sheet is formed of a resin composition containing a

non-carbonaceous thermoplastic resin and a conductive agent. Stamping molding is applied to the sheet.

USE - The method produces a **separator** for a **fuel cell**.

ADVANTAGE - The method efficiently produces the **separator** having superior gas impermeability, electrical conductivity, thermal conductivity, mechanical strength, and acid resistance without a carbonization process, or a cutting process. Molding forms a high groove (a gas passage) having high dimensional accuracy without the carbonization process, or the cutting process. The use of the polyphenylene sulfide-based resin yields the **groove-bearing separator** having superior heat resistance, mechanical strength, durability including acid resistance, hot water resistance at a lower cost in high accuracy by the stamping molding.

Dwg.0/0

TECH JP 2001122677 AUPTX: 20010724

TECHNOLOGY FOCUS - POLYMERS - The thermoplastic resin consists of a polyphenylene sulfide-based resin. The conductive agent consists of at least one selected from graphite **particles**, and conductive **carbon** black.

FS EPI

FA AB

MC EPI: X16-C; X16-C16; X16-F02

L73 ANSWER 13 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1994-344688 [43] WPIX

DNN N1994-270497 DNC C1994-156878

TI **Fuel cell** multilayer arrangement - has **separator** with **slots** on one surface that conducts electrolyte storage layer with opposite surface housing **carbon powder** layer NoAbstract.

DC L03 X16

PA (TOKE) TOSHIBA KK

CYC 1

PI JP 06267558 A 19940922 (199443)* 5p H01M008-02

ADT JP 06267558 A JP 1993-55308 19930316

PRAI JP 1993-55308 19930316

IC ICM H01M008-02

AB JP 06267558 A UPAB: 19941216

Dwg.1/9

FS CPI EPI

FA NOAB; GI

MC CPI: L03-E04

EPI: X16-C; X16-F02

L73 ANSWER 14 OF 14 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1987-151491 [22] WPIX

DNN N1987-113639 DNC C1987-063198
 TI Electrode system for **fuel cell** - with flexible electrodes of carbon fibre.
 DC A85 E36 L03 P42 P73 X16
 IN ABE, H; FUNABASHI, M
 PA (KURE) KUREHA KAGAKU KOGYO KK
 CYC 6
 PI DE 3640108 A 19870527 (198722)* 18p
 FR 2590727 A 19870529 (198728)
 GB 2185247 A 19870715 (198728)
 JP 62123662 A 19870604 (198728)
 US 4759989 A 19880726 (198832) 19p
 GB 2185247 B 19891011 (198941)
 CA 1273993 A 19900911 (199042)
 DE 3640108 C 19910418 (199116)
 ADT DE 3640108 A DE 1986-3640108 19861124; FR 2590727 A FR 1986-16414
 19861125; GB 2185247 A GB 1986-28173 19861125; JP 62123662 A JP
 1985-264542 19851125; US 4759989 A US 1986-931085 19861117
 PRAI JP 1985-264542 19851125
 IC B05D003-02; B32B003-30; B32B007-12; B32B009-00; B32B018-00;
 C01B031-02; C04B035-52; H01M004-96; H01M008-02
 AB DE 3640108 A UPAB: 19930922

The electrode-system consists of flexible electrodes (1) and a **separator** (2). The electrodes are constructed using carbon fibres at least 1mm long bonded by a carbonised binder. At a temp. over 1000 deg.C. the binder changes into **carbon particles** which hold several fibres together. This electrode is in contact with the gases used in the **fuel-cell**. The gas is made to flow through arrays of **channels** formed into the **separator** or formed mechanically into the electrodes (11,11') whereby the channels on either side of the **separator** are at right angles to each other.

The **separator** (2) is wider than each electrode to allow parts (3,3') to be used to seal the edges of the electrodes, by arranging them on each side of the **separator** parallel to the **channels** in the electrodes. The top-surface of the channels are glued to the **separator**, if formed in the electrodes, or vice versa, via an intermediate layer of flexible graphite foil. This structure is calcined at a temp. over 850 C. under reduced pressure and/or an inert ambient. The edge-sealing strips (3) are attached in the same way or using a fluorocarbon polymer glue or sheet. This structure can then be assembled inside a gas-distribution-frame (fig.5) in which the openings (6,6') are channels for gas-supply open to those electrodes which have grooves abutting the side on which the openings are. The **separator** and gas-distribution frame are connected together with a flexible graphite foil or a layer of fluorocarbon resin.

USE/ADVANTAGE - The electrodes have a low density, allowing

gas-diffusion for a long period, and because of the flexibility do not show tears, cracks or flaking during handling or use. The other material properties are as those of current materials. The material is esp. suitable for use with phosphoric acid contg. **fuel-cells.**

1/7

ABEQ DE 3640108 C UPAB: 19930922

Electrode substrate, for a **fuel cell** of the wind tunnel for a type having gas reactants, is such that at least part of the substrate comprises a flexible C material (II) which is in contact with tunnels (I). (II) contains (a) a matrix of C fibres of mean length 6-50 mm and a dia. of 4-25 microns; and (b) C lumps, dispersed in (a), derived from an organic binder with a carbonisation yield of not less than 10%, the dia. of lumps (b) being 2-200 times that of the C fibres. The lumps (b) fix the C fibres in matrix (a) glidably on one another, but are not physically or chemically bonded on them. The amt. of C fibres is 5-50% and the amt. of lumps (b) is 5-70%, each based on the total vol. of flexible C material (II).

ADVANTAGE - C material used has excellent flexibility.

ABEQ GB 2185247 B UPAB: 19930922

An electrode substrate for a **fuel cell**, wherein at least a part of said electrode substrate comprises a flexible carbon material obtained from a composite material comprising carbon fibres of not less than 1 mm in mean length which have been treated at a temperature of not lower than 1000 deg.C and a binding agent, said electrode substrate being contacted with flow channels, of a reactant gas and said flexible carbon material comprising carbon lumps derived from said binding agent which are dispersed in the matrix of said carbon fibres and restrain a plurality of said carbon fibres and said carbon fibres slidably held to one another by said carbon lumps.

ABEQ US 4759989 A UPAB: 19930922

Electrode substrate for a **fuel cell** comprises a flexible carbon material having flexibility ratio D/d of up to 200, where D is dia. of curvature just before breakage of the material when bent and d is the material thickness. The material is obtd. by (1) treating polyacrylonitrile, rayon, phenol resin, or (an)isotropic pitch fibres at at least 1500 deg.C under reduced pressure or in an inert atmos.; (2) preparing a composite of the resulting carbon fibres of 6-50 mm mean length and 4-25 micron dia. and organic binder having carbonising yield at least 10%; (3) thermally moulding the obtd. composite and (4) wholly carbonising it by calcining under reduced pressure or in an inert atmos. at at least 850 deg.C. Carbon lumps derived from the binder are thus dispersed in the carbon fibre matrix and retain the fibres to slidably hold them together.

USE/ADVANTAGE - The electrode contacts the flow channels for a

reactant gas. It has high flexibility and good heat resistance and mechanical properties.

FS CPI EPI GMPI

FA AB; DCN

MC CPI: A10-E05B; A12-E06A; A12-S05T; E31-N04D; L03-E04B

EPI: X16-C; X16-E06

DRN 0270-U; 1669-U; 1842-U; 5086-P; 5086-U

PLC UPA 19930924

KS: 0209 0210 0229 0231 0374 0759 0947 1277 1282 1310 1983 1996 2007
2198 2200 2213 2215 2219 2318 2427 2434 2440 2486 2488 2491 2507
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3258 2682 2723 2729 2739 2820

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581 596 60- 609 623 627 651 664 665 688 722

CMC UPB 19930924

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DCN: R05086-U

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FILE LAST UPDATED: 1 MAR 2004 <20040301/UP>

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L75 ANSWER 1 OF 6 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2003-123816 JAPIO

TITLE: CELL VOLTAGE DETECTING DEVICE FOR **FUEL**
CELL

INVENTOR: KIKUCHI HIDEAKI; SATO MASAHIKO; ARIYOSHI
TOSHIAKI

PATENT ASSIGNEE(S): HONDA MOTOR CO LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003123816	A	20030425	Heisei	H01M008-04

APPLICATION INFORMATION

STN FORMAT: JP 2001-318157 20011016
ORIGINAL: JP2001318157 Heisei
PRIORITY APPLN. INFO.: JP 2001-318157 20011016
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2003

AN 2003-123816 JAPIO

AB PROBLEM TO BE SOLVED: To prevent a terminal of a cell voltage
detecting device from slipping off from a **separator** of a
fuel cell.

SOLUTION: With the cell voltage detecting device for the
fuel cell provided with a terminal 21 in contact
with a **separator** of each unit cell and detecting cell
voltage of a unit cell through the terminal 21, a contact part of
the **separator** 14 with which the terminal 21 is in contact
is constituted of a **groove** 16 fitted at a top edge of the
separator 14, and a whole cross section orthogonal to the
axis line of the terminal at the contact point is sunken in
the **groove** 16 when the terminal 21 is in a state inserted
into and in contact with the **groove** 16.

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IC ICM H01M008-04

ICS H01M008-10

L75 ANSWER 2 OF 6 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2002-246043 JAPIO

TITLE: SOLID POLYMER ELECTROLYTE **FUEL**
CELL

INVENTOR: SAKAI KATSUNORI; SHIMOTORI SOICHIRO

PATENT ASSIGNEE(S): TOSHIBA CORP

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002246043	A	20020830	Heisei	H01M008-02

APPLICATION INFORMATION

STN FORMAT: JP 2001-42307 20010219
ORIGINAL: JP2001042307 Heisei
PRIORITY APPLN. INFO.: JP 2001-42307 20010219
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2002

AN 2002-246043 JAPIO

AB PROBLEM TO BE SOLVED: To provide a solid electrolyte **fuel**
cell, having flooding phenomenon restricted by effectively
carrying a reactive gas to maintain the almost uniform partial
pressure of a vapor contained in the reactive gas.

SOLUTION: The solid polymer electrolyte **fuel cell**
comprises a first reactive gas **channel** 27 and a second

reactive gas **channel** 28, formed in a **separator** 26 in a meandering form ranging from an edge side to an **axis**, a reactive gas supply manifold 29 connected to the entrances of the first and second reactive gas **channels** 27, 28, a reactive gas exhaust manifold 30 connected to the exits of the first and second reactive gas **channels** 27, 28, and a cooling medium flow passage 30 which is formed along the entrance sides of the first and second reactive gas **channels** 27, 28.

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IC ICM H01M008-02
ICS H01M008-04; H01M008-10; H01M008-24

L75 ANSWER 3 OF 6 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2002-025571 JAPIO

TITLE: **FUEL CELL SEPARATOR**
, ITS MANUFACTURING METHOD, AND SOLID HIGH
POLYMER MOLECULE **FUEL CELL**

INVENTOR: SAITO KAZUO; HAGIWARA ATSUSHI; MIYAZAWA ATSUSHI

PATENT ASSIGNEE(S): NISSHINBO IND INC

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002025571	A	20020125	Heisei	H01M008-02

APPLICATION INFORMATION

STN FORMAT: JP 2000-204728 20000706
ORIGINAL: JP2000204728 Heisei
PRIORITY APPLN. INFO.: JP 2000-204728 20000706
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
Applications, Vol. 2002

AN 2002-025571 JAPIO

AB PROBLEM TO BE SOLVED: To obtain a highly efficient solid high polymer molecule **fuel cell** having a high gas sealing nature and an outstanding anti-impact nature, in which neither a cracking nor a fracture is generated in assembly, by using one part or all of a **fuel cell separator**, while enabling to mass-produce efficiently the quality **fuel cell separator** which has high elasticity, high conductivity, and outstanding gas impermeability.
SOLUTION: In the **fuel cell separator** which has a gas supply **slot** at one side or both sides formed with a composite for **fuel cell separator** composed of a conductive **carbon powder** and a binding material as principal components, the characteristics of the **fuel cell separator** and its manufacturing method, and the solid high polymer molecule **fuel cell** are that a total

occupied area of the conductive **carbon powder** which has the maximum length of the long **axis** direction in the perpendicular section of the above **fuel cell separator** of 70 μm or more, and the maximum length of the short **axis** direction of 30 μm or more, is 50% or more of the area of the perpendicular section.

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IC ICM H01M008-02
ICS H01M008-10
ICA H01M008-00

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L72 ANSWER 1 OF 10 HCA COPYRIGHT 2004 ACS on STN

137:96267 **Fuel cell Separator**, its

manufacture and **fuel cell**. Terasawa, Toshihisa;

Nezu, Shinji; Ishii, Masami (Aishin Seiki Co., Ltd., Japan). Jpn.

Kokai Tokkyo Koho JP 2002198062 A2 20020712, 6 pp. (Japanese).

CODEN: JKXXAF. APPLICATION: JP 2000-396060 20001226.

AB The **separator** is prep'd. by mixing **carbon**

powder 60-80 wt.% and thermoplastic resin 20-40 wt.%,

extruding the mixt. through a dual-axel screw kneader to form

pellets, pressing the pellets in a mold to form an even sheet, and

copying a corresponding pattern of **separator** contg. a

groove with a roller through the sheet.

IT 7440-44-0P, **Carbon**, uses

(**powder**; component of **separator** for
fuel cell)

RN 7440-44-0 HCA

CN Carbon (7CI, 8CI, 9CI) (CA INDEX NAME)

C

IC ICM H01M008-02

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell separator carbon**

powder thermoplastic resin

IT Fluoropolymers, uses

Polythiophenylenes

- (component of **separator** for **fuel cell**)
)
- IT **Fuel cell separators**
(manuf. of **fuel cell separator**)
- IT Kneading apparatus
Rolls
(manuf. of **separator** for **fuel cell**)
- IT Plastics, uses
(thermoplastics; component of **separator** for **fuel cell**)
- IT 7782-42-5, Graphite, uses 24937-79-9, Polyvinylidene fluoride
(component of **separator** for **fuel cell**)
)
- IT 7440-44-0P, Carbon, uses
(**powder**; component of **separator** for **fuel cell**)
- L72 ANSWER 2 OF 10 HCA COPYRIGHT 2004 ACS on STN
136:186721 **Separator** for solid polymer electrolyte
fuel cell and its manufacture. Nakazawa, Masato;
Nagamatsu, Takeo (Tokai Carbon Co., Ltd., Japan). Jpn. Kokai Tokkyo
Koho JP 2002063913 A2 20020228, 7 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 2000-250760 20000822.
- AB The **separator** has a **grooved** gas passage plate,
contg. 100 parts **carbonaceous powder** and 20-40
parts thermosetting resin, and a frame contg. 20-40 part
thermosetting resin and 100 part of a mixt., contg. 10-100 parts
carbon fiber 10-100 and 0-90 parts **carbonaceous**
powder. The **separator** is prep'd. loading a
pre-molded gas passage plate and pre-molded frame in a mold and hot
pressing.
- IC ICM H01M008-02
ICS H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST polymer electrolyte **fuel cell separator**
carbonaceous thermosetting resin; carbon fiber thermosetting resin
fuel cell separator
- IT **Fuel cell separators**
(structure and manuf. of carbonaceous **separator** with
carbon fiber contg. frames for polymer electrolyte **fuel**
cells)
- IT Carbon fibers, uses
Carbonaceous materials (technological products)
Phenolic resins, uses
(structure and manuf. of carbonaceous **separator** with
carbon fiber contg. frames for polymer electrolyte **fuel**
cells)
- IT Plastics, uses

(thermosetting; structure and manuf. of carbonaceous **separator** with carbon fiber contg. frames for polymer electrolyte **fuel cells**)

L72 ANSWER 3 OF 10 HCA COPYRIGHT 2004 ACS on STN

136:121082 **Grooved separators** for solid polymer **fuel cells**. Kobayashi, Masanori; Kabata, Seiichiro; Otani, Akira (Kureha Chemical Industry Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002025572 A2 20020125, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-208557 20000710.

AB The **separators** are integrated sheets of mixts. of graphite powder 65-80, thermosetting resins 15-30, and carbon fiber 5-15 wt.% having grooves on one or both sides and having vol. resistivity ≤ 10 m Ω -cm. The **separators** have high strength and are lightwt.

IC ICM H01M008-02
ICS H01M008-02; H01M008-10

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST lightwt strong **separator fuel cell**;
solid polymer **fuel cell separator**;
graphite carbon fiber binder **fuel cell separator**

IT Carbon fibers, uses
(M-207S; high-strength **grooved fuel cell separators** comprising graphite powder, carbon fibers, and thermosetting resins)

IT **Fuel cell separators**
(high-strength **grooved fuel cell separators** comprising graphite powder, carbon fibers, and thermosetting resins)

IT Phenolic resins, uses
(novolak; high-strength **grooved fuel cell separators** comprising graphite powder, carbon fibers, and thermosetting resins)

IT 7782-42-5, Graphite, uses
(SGO 45; high-strength **grooved fuel cell separators** comprising graphite powder, carbon fibers, and thermosetting resins)

IT 390763-12-9, PB 2411
(high-strength **grooved fuel cell separators** comprising graphite powder, carbon fibers, and thermosetting resins)

L72 ANSWER 4 OF 10 HCA COPYRIGHT 2004 ACS on STN

134:355504 **Separators** for solid polymer electrolyte

fuel cells. Tani, Taiyo; Matsuoka, Takeshi (Tokai Carbon Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2001143721 A2 20010525, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-327839 19991118.

- AB The **grooved separators** are molded mixts. contg. 15-40% thermosetting resin and 60-85% **C powder**, having av. particle diam. $\leq 50 \mu\text{m}$ and max. particle diam. $\leq 300 \mu\text{m}$, and contg. $\leq 20\%$ particles with diam. $\leq 10 \mu\text{m}$; and have plate thickness 1-5 mm, groove thickness 10-50% that of the plate thickness, sp. resistance $\leq 2 \times 10^{-2} \Omega \cdot \text{cm}$ in their thickness direction, gas permeability $\leq 10^{-5} \text{ cm}^3/\text{cm}^2 \cdot \text{min}$, room temp. bending strength $> 300 \text{ kg/cm}^2$, and retaining $\geq 90\%$ the strength at 100° .
- IC ICM H01M008-02
ICS H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST polymer electrolyte **fuel cell** thermosetting carbon **separator**; **fuel cell** thermosetting resin carbon **separator**
- IT Permeability
(gas; specifications for thermosetting resin-carbon composite **separators** for polymer electrolyte **fuel cells**)
- IT Bending strength
Electric resistance
(specifications for thermosetting resin-carbon composite **separators** for polymer electrolyte **fuel cells**)
- IT Phenolic resins, uses
(specifications for thermosetting resin-carbon composite **separators** for polymer electrolyte **fuel cells**)
- IT 7782-42-5, Graphite, uses
(controlled particle size of graphite in thermosetting resin-carbon **separators** for polymer electrolyte **fuel cells**)

L72 ANSWER 5 OF 10 HCA COPYRIGHT 2004 ACS on STN

131:288877 **Separators** for solid polymer electrolyte

fuel cells separator component and their manufacture. Enomoto, Mitsuo (Tokai Carbon Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11297337 A2 19991029 Heisei, 4 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-95717 19980408.

- AB The **separators** have hardened thermosetting resin layers, contg. dispersed **C particles**, on opposite sides of a thin metal plate, where the resin layers are grooved to form reaction gas passages. The **separators** are prepd. by kneading 100 parts **C powder** with 10-100 parts of

a thermoplastic resin, hot pressing the mixt. on metal plates, and grooving the resin layers.

- IC ICM H01M008-02
ICS H01M008-10
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST polymer electrolyte **fuel cell separator**
manuf; **fuel cell separator** carbon
resin metal plate
- IT **Fuel cell separators**
(**separators** having **grooved** phenolic
resin-graphite layers on stainless steel or nickel plates for
polymer electrolyte **fuel cells**)
- IT Phenolic resins, uses
(**separators** having **grooved** phenolic
resin-graphite layers on stainless steel or nickel plates for
polymer electrolyte **fuel cells**)
- IT 7440-02-0, Nickel, uses 7782-42-5, Graphite, uses 12597-68-1,
Stainless steel, uses
(**separators** having **grooved** phenolic
resin-graphite layers on stainless steel or nickel plates for
polymer electrolyte **fuel cells**)

L72 ANSWER 6 OF 10 HCA COPYRIGHT 2004 ACS on STN

131:7540 **Fuel cells, fuel cell**

separators, and manufacture of the **separators**.

Mizuno, Seiji (Toyota Motor Corp., Japan). Jpn. Kokai Tokkyo Koho
JP 11154521 A2 19990608 Heisei, 14 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1997-338120 19971121.

- AB **Fuel cells**, using H contg. fuel gas and O contg.
oxidant gas, have reaction gas passages in the cells; where at least
part of the member for the reaction gas passages contain a fire
retardant. Preferably, the fire retardant decomp. at a predetd.
temp. to release a gas and water. The **separators** have the
reaction gas, are composed of a carbonaceous material, and contain
the fire retardant. The **separators** are prepd. by mixing
C powder with a fire retardant and a thermosetting
resin, molding the mixt., and hot pressing the molded piece at a
temp. capable of hardening the resin without decompn.; or by
applying the fire retardant on molded conductive pieces.

- IC ICM H01M008-02
ICS H01M008-02
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **fuel cell** carbon **separator** fire
retardant
- IT Epoxy resins, uses
(bromo; **separators** contg. **grooved** reaction
gas passages and fire retardants for **fuel cells**
)

IT **Fuel cell separators**

(**separators** contg. **grooved** reaction gas passages and fire retardants for **fuel cells**)

IT 7782-42-5, Graphite, uses

(**separators** contg. **grooved** reaction gas passages and fire retardants for **fuel cells**)

IT 79-94-7D, Tetrabromo bisphenol A, epoxy polymers

(**separators** contg. **grooved** reaction gas passages and fire retardants for **fuel cells**)

L72 ANSWER 7 OF 10 HCA COPYRIGHT 2004 ACS on STN

126:133576 Magnetic composites exhibiting distinct flux properties due to gradient interfaces and their use in **fuel cells**

and batteries. Leddy, Johna; Amarasinghe, Sudath; Zook, Lois Anne; Tinoco, Flavio (Leddy, Johna, USA; Amarasinghe, Sudath; Zook, Lois, Anne; Tinoco, Flavio). PCT Int. Appl. WO 9641391 A1 19961219, 214 pp. DESIGNATED STATES: W: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, NL, PT, SE.

(English). CODEN: PIXXD2. APPLICATION: WO 1996-US10509 19960607.

PRIORITY: US 1995-486570 19950607; US 1996-597026 19960205.

AB The composites comprise 15-99.99 ion exchange polymer (Nafion) and 0.01-15 wt.% magnetic microbeads. The composites further comprise an elec. conductor (**C particles**) in assocn. with a catalyst (Pt). The composites effect transport and sepn. of different chem. species. Devices using the composites include a **separator**, an electrode for **channeling** flux of magnetic species, an electrode for effecting electrolysis of magnetic species, a system for channeling electrolyte species, a system for sepg. particles with different magnetic susceptibilities, improved **fuel cells**, batteries, and O concentrators. Some composites can be used to make a **separator** for distinguishing between 2 species of materials and a flux switch to regulate the flow of a chem. species. Some composites can control chem. species transport and distribution. Other composites enable ambient pressure **fuel cells** having enhanced performance and reduced wt. Some other composites enable secondary batteries that have longer cycle life and improved output power. Still other composites, disposed on the surface of electrodes, prevent passivation of those electrodes and enable direct reformation of liq. fuels. Methods involving these composites provide distinct ways for their use.

IC ICM H01M008-00

ICS H01M008-04; H01M008-24; H01M004-86; H01M004-90; H01M004-36; H01M004-52; H01M004-58; H01M002-14; H01M002-16; H01M002-18; H01M002-00; H01M004-00; H01M006-00; H01M010-00; C25B011-00;

- C25B011-04; C25B011-12; C25B013-00; C25B015-00
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38, 77
- ST magnetic composite **fuel cell** battery;
separator magnetic composite; ion exchange polymer magnetic
composite; carbon platinum magnetic composite; microbead magnetic
composite
- IT **Fuel cells**
Secondary batteries
(magnetic composites exhibiting distinct flux properties due to
gradient interfaces and their use in)
- IT Composites
(magnetic; exhibiting distinct flux properties due to gradient
interfaces and use in **fuel cells** and
batteries)
- L72 ANSWER 8 OF 10 HCA COPYRIGHT 2004 ACS on STN
122:295368 **Fuel cell** stacks with carbonaceous
separators. Horio, Taishin (Ibiden Co Ltd, Japan). Jpn.
Kokai Tokkyo Koho JP 07057745 A2 19950303 Heisei, 3 pp. (Japanese).
CODEN: JKXXAF. APPLICATION: JP 1993-228011 19930819.
- AB The **fuel cell** stacks have unit cells having
their electrolyte matrixes held between a pair of **separators**
; where the **separators** are rectangular porous carbonaceous
plates having grooves formed on 1 side and a carbonized layer,
formed from carbonization of an impregnated **C**
powder-thermosetting resin mixt., on the other side. The 2
separators are arranged with their grooved sides facing each
other with the extending direction of **grooves** on 1
separator perpendicular to those on the other
separator. The thermosetting resin is selected from
phenolic resin, furan resin, divinylbenzene resin and/or a
condensation copolymer of a condensed ring org. compd. and an arom.
crosslinking agent having ≥ 2 hydroxymethyl and/or halomethyl
group and ≥ 1 arom. rings.
- IC ICM H01M008-02
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
- ST **fuel cell** carbonaceous **separator**;
thermosetting resin carbonaceous **separator**
- IT Carbonaceous materials
(carbonaceous **separators** for **fuel**
cell stacks)
- IT Phenolic resins, uses
(carbonaceous **separators** for **fuel**
cell stacks)
- IT Polymers, uses
(arom., condensation, carbonaceous **separators** for
fuel cell stacks)

- IT **Fuel cells**
(**separators**, carbonaceous **separators** for **fuel cell** stacks)
- IT 110-00-9D, Furan, derivs., polymers 9003-69-4, Polydivinylbenzene
(carbonaceous **separators** for **fuel cell** stacks)
- L72 ANSWER 9 OF 10 HCA COPYRIGHT 2004 ACS on STN
107:202130 Tubular carbon bipolar electrode for **fuel cells**. Kaji, Hisatsugu; Saitoh, Kuniyuki (Kureha Chemical Industry Co., Ltd., Japan). Fr. Demande FR 2588421 A1 19870410, 22 pp. (French). CODEN: FRXXBL. APPLICATION: FR 1986-13847 19861003. PRIORITY: JP 1985-221438 19851004.
- AB The electrode has 2 porous C sheets with inner channels for reactant gas flow and a flexible graphite sheet **separator** longer than the electrodes; all the components are in a C-based unit structure assembled with an adhesive and treated at >800° in an inert atm. A tubular **fuel cell** electrode was made from C fibers-phenolic resin-poly(vinyl alc.) particles, ground and treated at 135°; compact **C particle** sheets were used to fabricate the gas flow **channels**, and a Grafoil **separator** was placed between the electrodes; the assembly was treated at 135° and 10 kg/cm2 for 20 min and heated at 2000° for 60 min under N.
- IC ICM H01M004-88
ICS H01M008-24
- CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38
- ST electrode carbon **fuel cell**
- IT Carbon fibers, uses and miscellaneous
(electrodes contg., carbon bipolar, for **fuel cells**)
- IT Electrodes
(**fuel-cell**, carbon, bipolar, manuf. of)
- IT Epoxy resins, uses and miscellaneous
(phenoxy, in manuf. of carbon bipolar electrodes, for **fuel cells**)
- IT 7440-44-0
(carbon fibers, electrodes contg., carbon bipolar, for **fuel cells**)
- IT 7782-42-5, Graphite, uses and miscellaneous
(electrodes contg., carbon bipolar, for **fuel cells**)
- IT 7440-44-0, Carbon, uses and miscellaneous
(electrodes of porous, bipolar, for **fuel cells**)
- IT 9002-89-5, Poly(vinyl alcohol)
(in manuf. of carbon bipolar electrodes, for **fuel**

cells)

L72 ANSWER 10 OF 10 HCA COPYRIGHT 2004 ACS on STN

104:8327 Electrode material for **fuel cells**.

Shigeta, Masatomo; Fukuda, Hiroyuki; Kaji, Hisatsugu; Saitoh, Kuniyuki (Kureha Chemical Industry Co., Ltd., Japan). Ger. Offen. DE 3512865 A1 19851024, 66 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1985-3512865 19850406. PRIORITY: JP 1984-69870 19840406; JP 1984-140251 19840706.

AB **Fuel-cell** electrodes comprise a gas-impermeable carbonaceous **separator** layer sandwiched between 2 porous carbonaceous layers. The **separator** layer has 2-10-mm-diam. channels running parallel to 1 of the **separator** sides. The porous layers have 0.5-3-mm-diam. channels running parallel to the electrode surface and to 1 of the electrode sides. Channels in 1 porous layers run perpendicularly to the channels in the other porous layer. **Channels** in the **separator** layers are for the cooling medium and those in the porous layers are for reactant gases. Each porous layer can consist of 2 layers of different d. (0.4-0.8, 0.5-1.0 g/cm³) and porosity. Thus, d., porosity, gas permeability, thermal cond., and resistivity for all electrode layers are given, and prepns. of these layers from **C particles** and fibers with and without org. pore formers and of channels in these layers by carbonization of polymers are described.

IC ICM H01M004-96

ICS H01M004-88

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

ST electrode **fuel cell**

IT Electrodes

(**fuel-cell**, carbonaceous porous, with channels for reactant gases and gas-impermeable **separator** layer with **channels** for cooling medium)

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FILE LAST UPDATED: 26 FEB 2004 <20040226/UP>

MOST RECENT DERWENT UPDATE: 200414 <200414/DW>

DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

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L74 ANSWER 1 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2004-099270 [10] WPIX
DNN N2004-079094
TI **Fuel cell** for vehicle, has two **channels**
supplying fuel gas and oxygen-containing gas to anode and cathode,
respectively, and electrolyte electrode assemblies set along virtual
circle concentric with central **axis** of **separators**

DC X16 X21
IN TSUNODA, T
PA (HOND) HONDA MOTOR CO LTD; (HOND) HONDA GIKEN KOGYO KK
CYC 103
PI WO 2004004038 A2 20040108 (200410)* EN 77p H01M008-02
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT
KE LS LU MC MW MZ NL OA PT SD SE SI SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS KE
KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NI
NO NZ OM PH PL PT RO RU SC SD SE SG SK SL TJ TM TN TR TT TZ
UA UG UZ VC VN YU ZA ZM ZW
JP 2004039254 A 20040205 (200411) 15p H01M008-24
US 2004028986 A1 20040212 (200412) H01M008-24
ADT WO 2004004038 A2 WO 2003-JP8099 20030626; JP 2004039254 A JP
2002-190004 20020628; US 2004028986 A1 US 2003-608592 20030627
PRAI JP 2003-134190 20030513; JP 2002-190004 20020628; JP 2002-249520
20020828
IC ICM H01M008-02; H01M008-24
ICS H01M008-12
AB WO2004004038 A UPAB: 20040210
NOVELTY - The **fuel cell** has a pair of
separators (58) with two plates (60,62) stacked together. A
fuel gas **channel** (67) to supply a fuel gas to an anode and
a gas **channel** (82) to supply an oxygen-containing gas to a
cathode are formed between the plates. Electrolyte electrode
assemblies (56) are arranged along a virtual circle concentric with
a central **axis** of the **separators**.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included
for a **fuel cell** stack.
USE - Used in vehicle and a gas turbine.
ADVANTAGE - The electrolyte electrode assemblies are arranged
along the virtual circle concentric with the central **axis**
of the **separators**, thereby providing a compact structure
and a high power outputting performance of a **fuel**
cell.
DESCRIPTION OF DRAWING(S) - The drawing shows an exploded
perspective view of a **fuel cell**.
Electrolyte electrode assemblies 56
Separators 58
Plates 60,62

Fuel gas **channel** 67

Oxygen-containing gas **channel** 82

Dwg.4/25

FS EPI

FA AB; GI

MC EPI: X16-C16; X16-E06A; X21-A01F; X21-B01A

L74 ANSWER 2 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2004-042358 [04] WPIX

DNN N2004-034267

TI **Fuel cell**, has two current collectors which are combined with **separators** so as to form separate gas passages, for fuel and oxidant gas supply.

DC X16

IN IKEZOE, K

PA (NSMO) NISSAN MOTOR CO LTD

CYC 30

PI WO 2003088394 A2 20031023 (200404)* EN 25p H01M008-02

RW: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LU MC NL
PT RO SE SI SK TR

W: CN KR US

JP 2003308856 A 20031031 (200404) 8p H01M008-02

ADT WO 2003088394 A2 WO 2003-JP3235 20030318; JP 2003308856 A JP
2002-110582 20020412

PRAI JP 2002-110582 20020412

IC ICM H01M008-02

ICS H01M008-10; H01M008-24

AB WO2003088394 A UPAB: 20040115

NOVELTY - The flat plate shaped porous **separators** made of water permeable material, is arranged between an anode and a cathode. A primary current collector (2) is arranged between the anode and a **separator**. A secondary current collector is arranged between the cathode and **separator**. The two current collectors and **separators** are coupled mutually so that fuel gas and gaseous oxidant are guided through the **channels** formed by the coupling structure.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for manufacturing method of **fuel cell**.

USE - **Fuel cell**.

ADVANTAGE - The internal pressure loss is low and hence the total pressure required to supply gas is minimized and gas passage structure is simplified.

DESCRIPTION OF DRAWING(S) - The figure shows the plan view of **separator** and current collector plate in **fuel cell**.

separator 1

current collector 2,6

gas **channel** 12

current collector plates 14,15

slit 20

longitudinal **axis** 30

Dwg.3A/9

FS EPI

FA AB; GI

MC EPI: X16-C16; X16-F03A

L74 ANSWER 3 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-467577 [44] WPIX

DNN N2003-372122

TI Cell voltage measuring device for **fuel cell**, has terminal contacting **separator** at contact region such that more than half of cross-sectional area of terminal perpendicular to longitudinal **axis** is accommodated in **groove**.

DC X16

IN ARIYOSHI, T; KIKUCHI, H; SATO, M

PA (HOND) HONDA MOTOR CO LTD; (HOND) HONDA GIKEN KOGYO KK

CYC 2

PI US 2003072983 A1 20030417 (200344)* 12p H01M008-04

JP 2003123816 A 20030425 (200344) 7p H01M008-04

ADT US 2003072983 A1 US 2002-268153 20021010; JP 2003123816 A JP 2001-318157 20011016

PRAI JP 2001-318157 20011016

IC ICM H01M008-04

ICS H01M008-10

AB US2003072983 A UPAB: 20030710

NOVELTY - The device has a contact region provided on a **separator** to form a **fuel cell**. A

terminal (21) contacts the **separator** at the contact region that is defined by a **groove**, to measure cell voltage. The terminal is placed such that more than half of its area of cross-section perpendicular to the longitudinal **axis** at the contact point, is accommodated in the **groove**.

USE - Used for measuring **cell** voltage in **fuel cell**.

ADVANTAGE - The device provides reliability by inserting the terminal into the **groove** at the contact point, thus preventing terminal from being pulled out from the **groove** during vibrations.

DESCRIPTION OF DRAWING(S) - The device shows an enlarged view of the main portion of a cell voltage measuring device for a **fuel cell**.

Terminal. 21

Dwg.2/8

FS EPI

FA AB; GI

MC EPI: X16-C09

L74 ANSWER 4 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-131339 [13] WPIX
DNN N2003-104288
TI Electrochemical cell element bonding method in electrochemical energy converter, involves abutting sealing surfaces of cell **separator** plate to displays adhesive from protrusion to depression of **groove**.
DC X16
IN BINDEL, R F; DIAZ, F E R; EINHART, J; KIRBY, C T; MEDINA, M; REIFF, S; RYSSEL, H; RIVERA DIAZ, F E
PA (BALL-N) BALLARD POWER SYSTEMS INC; (BIND-I) BINDEL R F; (EINH-I) EINHART J; (KIRB-I) KIRBY C T; (MEDI-I) MEDINA M; (REIF-I) REIFF S; (DIAZ-I) RIVERA DIAZ F E; (RYSS-I) RYSSEL H
CYC 28
PI EP 1271678 A2 20030102 (200313)* EN 10p H01M008-02
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR
CA 2390949 A1 20021222 (200315) EN H01M002-14
US 2002197519 A1 20021226 (200316) H01M008-10
ADT EP 1271678 A2 EP 2002-13593 20020620; CA 2390949 A1 CA 2002-2390949 20020619; US 2002197519 A1 US 2001-888074 20010622
PRAI US 2001-888074 20010622
IC ICM H01M002-14; H01M008-02; H01M008-10
AB EP 1271678 A UPAB: 20030224
NOVELTY - A sealing **groove** (218) with a protrusion (220) and depression (222) is provided to a sealing surface of a cell **separator** plate (210). The sealing surface of the other cell **separator** plate (211) is abutted to the sealing surface of the plate (210) such that adhesive (214) deposited on the protrusion is displaced to the depression of the **groove**.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:
(1) Electrochemical cell; and
(2) Plate for use in electrochemical cell.
USE - For bonding element of electrochemical **cell** e.g. **fuel cell** of electrochemical energy converter.
ADVANTAGE - The bond between the adhesive and the protrusion resists separation of plates in both **axial** and lateral directions.
DESCRIPTION OF DRAWING(S) - The figure shows a cross-sectional view of the cell **separator** plate.
Cell **separator** plates 210,211
Adhesive 214
Sealing **groove** 218
Protrusion 220
Depression 222

Dwg.8/15

FS EPI
 FA AB; GI
 MC EPI: X16-C16

L74 ANSWER 5 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2000-543763 [49] WPIX

DNN N2000-402204 DNC C2000-161888

TI Gravitational electrolysis of water to produce hydrogen, used in
 e.g. vehicle **fuel cells**, by rotating electrolyte
 at a specific frequency inside the electrolyzer rotor.

DC E36 J03 X25

IN BLACH VIZOSO, R; FATEEV, V

PA (DAVI-N) DAVID SYSTEMS TECHNOLOGY SL

CYC 18

PI WO 2000049205 A1 20000824 (200049)* ES 65p C25B001-04

RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE

ADT WO 2000049205 A1 WO 1999-ES41 19990216

PRAI WO 1999-ES41 19990216

IC ICM C25B001-04

AB WO 200049205 A UPAB: 20001006

NOVELTY - An electrolyte solution is rotated at a specific frequency
 inside the rotor part of the electrolyzer.

DETAILED DESCRIPTION - A process for producing hydrogen by
 gravitational electrolysis of water comprises the following steps:

(a) rotating an aqueous electrolyte solution in the rotor part
 of a gravitational electrolyzer, generating a centrifugal force that
 creates an artificial gravitational field, allowing separation of
 the ionic species as a function of their weight, these species
 migrating to their respective electrodes ; and

(b) reducing the protons at the cathode in order to produce
 hydrogen.

The rotation frequency in step (a) is defined by the following
 equation (3): ω at least $((q \alpha q_K(1 - \alpha T))(16 \pi \epsilon_0 \Delta m \rho h K(r_0, 5) (2r \beta + r \mu)^2 - 1)^{1/2} (3)$

$q \alpha q_K$ = electrical charges for the electrolyte anion and
 cation (K_r) ;

T = absolute temperature of the solution (deg. K) ; Δm =
 difference in mass between the hydrated cations and anions (kg); ρ =
 linear ion concentration (M^{-1}), equal to $10 (C \times N)^{1/3}$, where C is
 moles/g concentration of the solution ($mole \times l^{-1}$), and N is
 Avogadro's number (mol^{-1}) ;

h = solution column height (m) ;

K = degree of electrolyte solution ($10^{-2} \%$) ;

r = internal radius of rotor (m) ; α = temperature exchange
 coefficient over the length of the hydrate bond (deg. K^{-1}) ; ϵ_0 =
 absolute dielectric constant ($phi \cdot m^{-1}$) ; ϵ_r = relative
 dielectric constant for water ;

r_{β} = effective water molecule radius (m) ;
 r_{μ} = effective charged ion radius (m) ; and
 $\pi = 3.141$.

An INDEPENDENT CLAIM is also included for the electrolyzer, which produces hydrogen and oxygen using a combination of electricity, heat and gravity.

USE - Hydrogen generated by the process can be used to provide heat, mechanical energy or electrical energy, e.g. for **fuel cells** in vehicle engines.

ADVANTAGE - An efficient means of generating hydrogen in order to provide power.

DESCRIPTION OF DRAWING(S) - Figure 1 shows a schematic sectional view of the hydrogen generator.

Casing 1

Bearing supports 2

Composite shaft 3

Rotor 4

Heat exchanger 5

Separator 6

Pipes for hydrogen, oxygen and water 7-10

Couplings 11-13

Flange 14

Gasket 15

Trolley 17

Channels 18, 19

Valve 22

Cover 26

Dwg.1/5

TECH WO 200049205 A1UPTX: 20001006

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Process: The electrolyte is an aqueous inorganic acid solution, preferably hydrobromic acid, nitric acid, sulfuric acid or perchloric acid, most preferably a 6M hydrobromic acid solution with a degree of dissociation (K) of 0.85. Metal electrodes are used.

TECHNOLOGY FOCUS - CHEMICAL ENGINEERING - Preferred Apparatus: The electrolyzer comprises a casing (1) with a mechanically rotated composite shaft (3) and a rotor (4) provided with a heat exchanger (5) and **separator** (6). The hydrogen and oxygen do not have to be separated if they are being supplied to an internal combustion engine, therefore the heat exchanger and **separator** are not necessary. The shaft is mounted in the casing via flanges (14) electrically insulated from one another by gaskets (15), and the **separator** is secured to discs mounted on the shaft, with the possibility of independent rotation relative to the casing, which is acting as the other electrode. The **separator** can comprise fine mesh panels or small membranes mounted on top of the discs in a way that allows some play, the discs being perforated in order to encourage normal circulation of the solution in the **axial**

direction. The outside of the casing and end of the shaft are connected to a trolley via sliding contacts. At least one of the discs contains radial perforations, to the side of which are protrusions projecting into a radial **channel** (19). A brake is used to ensure the disc rotates at a frequency less than that of the rotor, ensuring that liquid flows from the rotor to the external heat exchanger used to input thermal energy. Laminar flow of the solution over the electrode surfaces is generated, ensuring good removal of electrolysis products. Sec. heat generated during the process can be used for heating and for generating mechanical and electrical energy.

ABEX WO 200049205 A1UPTX: 20001006

EXAMPLE - None given.

KW [1] 97153-0-0-0 CL PRD; 3-0-0-0 CL

FS CPI EPI

FA AB; GI; DCN

MC CPI: E31-A02; J03-B

EPI: X25-H09; X25-R01

DRN 1532-P; 1532-U; 1740-S; 1740-U

CMC UPB 20001006

M3 *01* C101 C550 C810 M411 M424 M720 M740 M904 M905 N104 N120 N513
N514 N515

DCN: R01532-K; R01532-P

M3 *02* C101 C108 C550 C730 C800 C801 C802 C804 C805 C807 M411 M730
M904 M905 M910

DCN: R01740-K; R01740-S

L74 ANSWER 6 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2000-163359 [15] WPIX

CR 2000-056137 [05]; 2000-100167 [05]

DNN N2000-122033

TI Proton exchange membrane (PEM) **fuel cell** stack
separator plate for e.g. interconnecting flow
channels to form flow paths.

DC X16

IN MCLEAN, G F

PA (GASC) BG PLC

CYC 1

PI GB 2339062 A 20000112 (200015)* 53p H01M008-10

ADT GB 2339062 A GB 1999-15286 19990701

PRAI GB 1998-14121 19980701

IC ICM H01M008-10

AB GB 2339062 A UPAB: 20000323

NOVELTY - **Separator** plate (10) includes an array of embossments (12) at one end of the plate with another array (14) at the other end. Oxidant gas flowpaths are defined by the undulations membrane electrode assembly (MEA), whereby flow **channel** lines (24) are interconnected at their ends by depressions (16,18)

to provide a complete flow field (21). The fuel flowpaths are on one side of the **separator** and oxidant flowpaths being on the other side.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

- (1) a PEM-type **fuel cell** stack, and
- (2) the use of hydrogen as a fuel gas.

USE - For interconnecting, or coupling flow **channels** together to form flowpaths of flow field within a **fuel cell** sandwich.

ADVANTAGE - Enables ready creation and economical manufacture of suitable structure for providing flow fields without the need for any external manifolding other than for flowpath end connections.

DESCRIPTION OF DRAWING(S) - The drawing shows a schematic plan view of a simplified **separator** plate for use in a PEM-type **fuel cell** stack and provided with an array of embossments and depressions in the vicinity of the **axial** ends of the plate, and schematically illustrating a reactant flowpath formed thereon by such **separator** plate in conjunction with a mating undulate MEA layer.

Separator plate 10

Embossments 12,14

Depressions 16,18

Flow field 21

Flow **channel** lines 24

Dwg.1/8

FS EPI

FA AB; GI

MC EPI: X16-C01C; X16-C15

L74 ANSWER 7 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2000-000538 [01] WPIX

DNN N2000-000487

TI **Fuel-cell** stack with liquid cooling - has supply and distribution **channels** for cooling medium integrated in sealing frame surrounding inter-space between **separators** of **fuel-cell** units.

DC X16

IN BUCHNER, P; HELMOLT, R V; NOELSCHER, C; WAIDHAS, M; VON HELMOLT, R

PA (SIEI) SIEMENS AG

CYC 23

PI DE 19821767 A1 19991118 (200001)* 8p H01M008-04

WO 9960641 A2 19991125 (200003) DE H01M008-00

RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE

W: CA JP NO US

DE 19821767 C2 20000608 (200032) H01M008-04

EP 1086502 A2 20010328 (200118) DE H01M008-00

R: AT BE CH DE DK ES FI FR GB IT LI NL SE

EP 1086502 B1 20020410 (200227) DE H01M008-00
 R: AT BE CH DE DK ES FI FR GB IT LI NL SE
 JP 2002516465 W 20020604 (200239) 17p H01M008-24
 DE 59901199 G 20020516 (200240) H01M008-00
 ADT DE 19821767 A1 DE 1998-19821767 19980514; WO 9960641 A2 WO
 1999-DE1313 19990503; DE 19821767 C2 DE 1998-19821767 19980514; EP
 1086502 A2 EP 1999-930997 19990503, WO 1999-DE1313 19990503; EP
 1086502 B1 EP 1999-930997 19990503, WO 1999-DE1313 19990503; JP
 2002516465 W WO 1999-DE1313 19990503, JP 2000-550161 19990503; DE
 59901199 G DE 1999-501199 19990503, EP 1999-930997 19990503, WO
 1999-DE1313 19990503
 FDT EP 1086502 A2 Based on WO 9960641; EP 1086502 B1 Based on WO
 9960641; JP 2002516465 W Based on WO 9960641; DE 59901199 G Based on
 EP 1086502, Based on WO 9960641
 PRAI DE 1998-19821767 19980514
 IC ICM H01M008-00; H01M008-04; H01M008-24
 ICS H01M008-02
 AB DE 19821767 A UPAB: 20000105
 A **fuel-cell** stack having at least two
fuel-cell (BZ) units (4) in which a sealing frame
 (1) tightly encloses the intermediate space between the
separators of BZ-units (4) for receiving a cooling medium.
 In the **fuel-cell** stack, the supply- and
 distribution-**channels** for the cooling medium are
 specifically integrated in the sealing frame (1).
 The **axial channels** are specifically formed
 by stacking the individual BZ-units with support rings, which have
axial and radial borings, positioned between them.
 USE - Liquid cooled **fuel-cell** batteries.
 ADVANTAGE - Cost-favourable and compact design for liquid
 cooling of **fuel cell** stack.
 Dwg.2/5
 FS EPI
 FA AB; GI
 MC EPI: X16-C; X16-C09; X16-K
 L74 ANSWER 8 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
 AN 1989-300354 [41] WPIX
 DNN N1989-229117 DNC C1989-132857
 TI Monolithic solid oxide **fuel cell** stack -
 amenable to simple reactant feeding and manifolding and is free from
 micro-cracks in its component layers.
 DC L02 L03 P42 X16
 IN BUSWELL, R F; MARICLE, D L
 PA (ITFU) INT FUEL CELLS CORP
 CYC 1
 PI US 4857420 A 19890815 (198941)* 8p
 PRAI US 1987-107817 19871013

IC B05D005-12; H04M008-10

AB US 4857420 A UPAB: 19930923

A monolithic solid oxide **fuel cell** stack is formed by: (a) forming electrode sub-assemblies by: (i) providing appropriately sized green unsintered tapes of solid oxide electrolyte material; (ii) sintering tapes to form plates of electrolyte material of appropriate operational density; (iii) forming a finished layer of oxide material on one surface of sintered electrolyte plates; (iv) forming a finished layer of cathode on an opposite surface of sintered electrolyte plates; (b) forming gas **separator**-reactant flow field sub-assemblies by: (i) providing appropriately sized green unsintered sheets of interconnect material; (ii) sintering sheets to form laminae of interconnect material; (iii) forming a finished anode flow field layer of anode material on one surface of laminae, anode flow field layers including parallel ribs and intervening **grooves** extending across laminae in a first direction; (iv) forming a finished cathode flow field layer on an opposite surface of laminae, cathode flow field layers including parallel ribs and intervening **grooves** extending across laminae in a second direction perpendicular to first direction; (c) stacking electrode sub-assemblies and gas **separator**-reactant flow field sub-assemblies one atop the other in alternating fashion with cathode material layers abutting anode flow field layers to form a stack pre-assembly; (d) heating stack preassembly to an elevated subsintering temp. to cause softening of subassemblies which may be creep flattened to form an intimate interfacial contact; (e) applying a light compressive load **axially** to stack preassembly during heating to cause them to fuse together into a monolithic stack structure.

USE/ADVANTAGE - A method for making an improved monolithic solid oxide **fuel cell** stack which is amenable to simple reactant feeding and manifolding and is relatively free from micro-cracks in its component layers.

4/5

FS CPI EPI GMPI

FA AB; GI

MC CPI: L03-H04A

EPI: X16-C

L74 ANSWER 9 OF 9 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 1978-23059A [12] WPIX

TI Oxygen-hydrogen **fuel cell** - with hollow electrodes and tightening bolts with **channels** for gases supply.

DC L03 X16

IN DAVTIN, O K; MISYUK, E G; YUTROV, A P

PA (DAVT-I) DAVTYAN O K

CYC 1
PI SU 256833 A 19770415 (197812)*
PRAI SU 1968-1241137 19680515
IC H01M002-00
AB SU 256833 A UPAB: 19930901

Oxygen-hydrogen **fuel cell** consists of a tank with electrolyte in which is suspended from a cover a packet of hollow positive and negative electrodes. Supply of gases to electrodes is provided by external pipes and horizontal hollow bolts also used for tightening the assembly.

Each bolt is in contact with electrodes of one polarity and is insulated by **separators** from electrodes of other polarity. The gas is distributed to electrodes through radial holes of lower bolt. The gas is collected from the **axial channel** of the upper bolt.

FS CPI EPI
FA AB
MC CPI: L03-E04